# PHYSICAL CONSTANTS OF HYDROCARBONS

## Volume IV
## POLYNUCLEAR AROMATIC HYDROCARBONS

GUSTAV EGLOFF

DIRECTOR OF RESEARCH
UNIVERSAL OIL PRODUCTS COMPANY
RESEARCH LABORATORIES
CHICAGO, ILLINOIS

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1947

**Dedicated to**

JOSEPH G. ALTHER

# GENERAL INTRODUCTION

## American Chemical Society Series of Chemical Monographs

By arrangement with the Interallied Conference of Pure and Applied Chemistry, which met in London and Brussels in July, 1919, the American Chemical Society was to undertake the production and publication of Scientific and Technologic monographs on chemical subjects. At the same time it was agreed that the National Research Council, in cooperation with the American Chemical Society and the American Physical Society, should undertake the production and publication of Critical Tables of Chemical and Physical Constants. The American Chemical Society and the National Research Council mutually agreed to care for these two fields of chemical development. The American Chemical Society named as Trustees, to make the necessary arrangements for the publication of the monographs, Charles L. Parsons, secretary of the Society, Washington, D. C.; the late John E. Teeple, then treasurer of the Society, New York; and the late Professor Gellert Alleman of Swarthmore College. The Trustees arranged for the publication of the A.C.S. series of (a) Scientific and (b) Technologic Monographs by the Chemical Catalog Company, Inc. (Reinhold Publishing Corporation, successors) of New York.

The Council of the American Chemical Society, acting through its Committee on National Policy, appointed editors (the present list of whom appears at the close of this introduction) to select authors of competent authority in their respective fields and to consider critically the manuscripts submitted.

The first monograph of the series appeared in 1921. After twenty-three years of experience certain modifications of general policy are indicated. In the beginning there still remained from the preceding five decades a distinct though arbitrary differentiation between so-called "pure science" publications and technologic or applied science literature. This differentiation is fast becoming nebulous. Research in private enterprise has grown apace and not a little of it is pursued on the frontiers of knowledge. Furthermore, most workers in the sciences are coming to see the artificiality of the separation. The methods of both groups of workers are the same. They employ the same instrumentalities, and now frankly recognize that their objectives are common, namely the search for new knowledge for the service of man. The officers of the Society therefore have combined the two editorial Boards in a single Board of twelve representative members.

Also in the beginning of the series, it seemed expedient to construe rather broadly the definition of a monograph. Needs of workers had to be recognized. Consequently among the first one hundred monographs appeared works in the form of treatises covering in some instances rather broad areas. Because such necessary works do not now want for publishers, it is considered advisable to hew more strictly to the line of the monograph character which means more complete and critical treatment of relatively restricted areas, and where a broader field needs coverage, to subdivide it into logical sub-areas. The prodigious expansion of new knowledge makes such a change desirable.

These monographs are intended to serve two principal purposes: first, to make available to chemists a thorough treatment of a selected area in form usable by persons working in more or less unrelated fields to the end that they may correlate their own work with a larger area of physical science discipline; second, to stimulate further research in the specific field treated. To implement this purpose the authors of monographs are expected to give extended references to the literature. Where the literature is of such volume that a complete bibliography is impracticable, the authors are expected to append a list of references critically selected on the basis of their relative importance and significance.

# Preface

The principal source of polynuclear aromatic hydrocarbons is coal-tar. Some of these compounds are also found in petroleum and other natural sources, and many are produced synthetically. Commercial utilization of these hydrocarbons has been confined essentially to the dyestuff industry. Among the polynuclears are compounds of physiological interest such as the carcinogenic or cancer producing hydrocarbons.

Volume IV is a collation of all melting point, boiling point, density, and refractive index data available on polynuclear aromatic hydrocarbons. This survey shows that the opportunities for research on polynuclear aromatics are far from being exhausted. The thousands of known compounds represent only a small fraction of the theoretical possibilities. The physical data on the known compounds are so scanty that there is a great need for investigation of the physical constants of polynuclears.

We are indeed grateful to the staff of John Crerar Library for valuable guidance in the location of material and for privileges granted in connection with use of the outstanding facilities of this institution.

Deep appreciation is hereby expressed for the assistance of the Universal Oil Products Company and the author's colleagues, Mary Alexander, Nancy Corbin, M. S. Beyt, and Madge Spiegler, in this collation and critical study of the physical constants of aromatic hydrocarbons.

GUSTAV EGLOFF

Chicago, Ill.,
March 1, 1946

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## *Volume IV*

# INTRODUCTION

## Foreword

The fourth volume of Physical Constants of Hydrocarbons is a collation and evaluation of the physical constants of polynuclear aromatic hydrocarbons. The compounds included under this classification are fused ring hydrocarbons having at least one aromatic ring.

The study conducted for this volume is a continuation of that made for Volume III.[1] References through April, 1945 were added to those collected concurrently with material for the previous volume. Details concerning the extent of literature coverage are explained in the Introduction to Volume III.

Although thousands of polynuclear aromatic hydrocarbons have been prepared, these compounds represent only a minor fraction of the theoretical possibilities. A great number of the larger polynuclears have been synthesized in recent years particularly in connection with cancer research and other physiological problems.

The present study also shows that the published data for many of the known compounds are insufficient for the identification of these compounds on the basis of physical properties alone. Identification of the carcinogenic and other higher polynuclear hydrocarbons has been markedly facilitated by the study of their ultraviolet, infrared, and Raman spectra.

Critical evaluation of the data in Volume IV was limited by the paucity of data available from the literature. Fewer constants have been determined for the polynuclear aromatics than for the mononuclear aromatics and consequently, the tabulations in this volume are not made with the discrimination possible in Volume III. For example, in Volume IV, melting ranges of over 2° and boiling ranges greater than 5° have been recorded for many compounds because these figures were the only ones available. Likewise, refractive index and density values for which temperature conditions were not stated in the literature appear in Volume IV. Many of these values have apparently been determined on the compound in the solid state, but a notation of the state of aggregation is included in the tabulations only when verified by the reference.

The methods used in the calculation of the most probable values of constants are described in the Introduction of Volume III. The lack of data for the polynuclear aromatics makes it impossible to calculate "best values" for many of the compounds. Only melting point data are available on the greater portion of the polynuclears. Boiling point, density, and refractive index values have been determined for only a very few polynuclears and in most cases the number of values determined is too small to permit the calculation of constants of equations representing them.

[1] Egloff, G., "Physical Constants of Hydrocarbons," Volume III, Reinhold Publishing Corporation, New York, **1946**.

**Nomenclature**

Inasmuch as the nomenclature used for the polynuclear aromatic hydrocarbons in Volume IV does not rigidly follow any previously described system, it will be explained in the following discussion. "The Ring Index"[1] provides the only system sufficiently developed to permit the naming of the nuclei of all polynuclear hydrocarbons. Primarily an attempt is made to conform to these rules, but complications arising in the nomenclature of many derivative compounds necessitate departures from this system. Although the present study gives much evidence for the desirability of an entirely new system, the terminology herein is confined to that already in use. The nomenclature of this volume is also chosen with the intention of offering pictures of the structure which may be readily visualized.

A nomenclature system of basically different character has been proposed by Van Arsdell and Egloff,[2] and another was partially elucidated by Clar.[3] Both of these systems provide methods for simplifying problems of nomenclature, but neither is broad enough in scope to be applied to all compounds. The previously mentioned systems are compared in Table I.

The nomenclature proposed by either Van Arsdell and Egloff or Clar is more scientifically systematic than that of Patterson or that used in this volume. In the Van Arsdell and Egloff system, the general term *-zene* prefixed by the appropriate Greek numerical term designates a straight row of fused rings and, when further prefixed by *iso-*, a fused structure of the phenanthrene type. Clar makes use of the general term *-acene,* with the appropriate prefix, to designate straight row fusions and the term *-phene* for phenanthrene type structures. By using Roman numerals to designate the number of rings in each row, Clar's system can be extended to include compounds having one or more rings fused at an angle. According to Van Arsdell and Egloff, *peri*-fusions, as shown in example six, are defined by prefixing *peri-* to the *-zene* name. Despite the advantages of these systems, classical names such as phenanthrene, anthracene, and naphthacene are used in this volume to facilitate its use by scientists who are accustomed to thinking in terms of these names.

The use of letters to denote ring fusions, a point at which the present volume diverges from Patterson and Capell, will be treated in detail under a discussion on numbering and lettering. In a few cases, the basic names preferred by these authors are objectionable. Essentially different ones, therefore, are used. For example, the name "benzonaphthene," given to compound No. 6 in Table I, is scientifically ambiguous because the term "naphthene" is used indiscriminately throughout the literature to refer to several compounds and to a class of compounds.

In order to classify the compounds and name them with any degree of con-

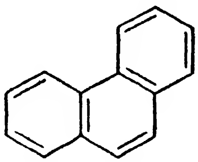
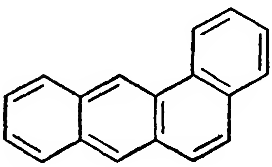
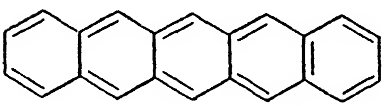
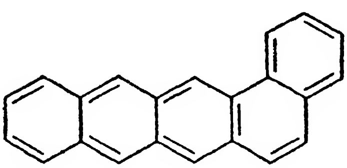
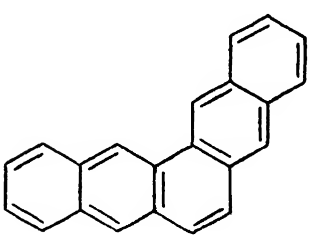
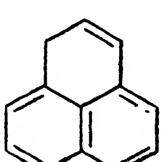
[1] Patterson, A. M., and L. T. Capell, "The Ring Index," Reinhold Publishing Corporation, New York, **1940.**

[2] Van Arsdell, P. M., and G. Egloff, "Nomenclature of Cyclic Hydrocarbons," paper presented before the American Chemical Society, Atlantic City, September, **1941.**

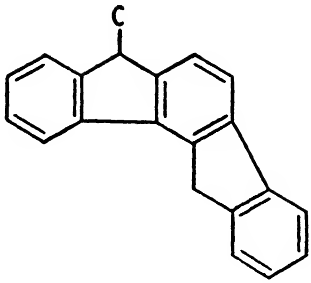
[3] Clar, E., "Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, **1941.**

sistency, the name given in the literature is disregarded in many instances. Frequently the literature name bears no relation to the structure, is misleading,

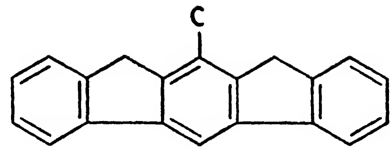
TABLE I

| | Name used in Volume IV | Patterson | Egloff & Van Arsdell | Clar |
|---|---|---|---|---|
| 1.  | Phenan-threne | Phenan-threne | Isotri-zene | Triphene |
| 2.  | 1,2-Benzo-anthra-cene | Benzo [a]-anthra-cene | Isotetra-zene | Tetra-phene-(I, II) |
| 3.  | Pentacene | Pentacene | Penta-zene | Pentacene |
| 4.  | 1,2-Benzo-naph-thacene | Benzo[a]-naphtha-cene | Isopen-tazene | Penta-phene-(I, III) |
| 5.  | 2,3,6,7-Di-benzo-phenan-threne | Dibenzo-[bh]-phenan-threne | | Penta-phene-(II, II) |
| 6.  | Phenalene | Benzo-naph-thene | Peritri-zene | |

or actually defines the compound incorrectly. The names "phthalacene" and "isophthalacene," for example, give no clue to structure.

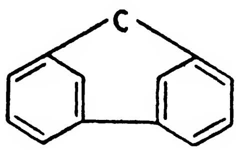


Phthalacene

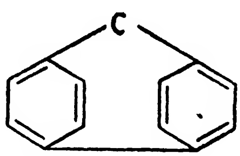


Isophthalacene

The many names assigned throughout the literature to fluorene and its derivatives provide illustrative examples of faulty nomenclature. Fluorene is often called "diphenylenemethane," a term applicable to more than one compound. The following structures, with which fluorene might be confused if named "diphenylenemethane", are also reported.[1] When the name "di-

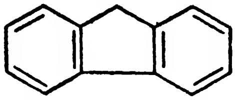


γ-Methylenediphenylene

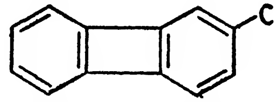


δ-Methylenediphenylene

phenylenemethane" is qualified by *o*-, *m*- or *p*- it has structural significance, but even then may be confused with "methylbiphenylenes" which have also been called "diphenylenes."



Fluorene or
*o*-Diphenylenemethane

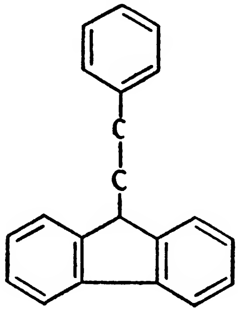


2-methylbiphenylene

The diphenylene terminology is particularly misleading when used in reference to fluorene derivatives. The following compound, which is named

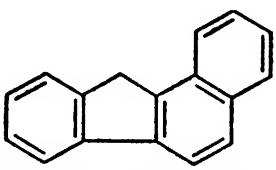
[1]Carnelley, T., J. Chem. Soc. **37**, 701 1880.

9-phenethylfluorene in this volume, can be named as an ethane or propane according to the various methods of notation found in the literature:

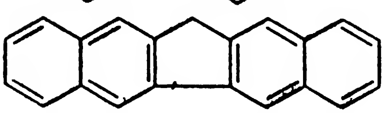



1-Diphenylene-3-phenylpropane
α-Diphenylene-γ-phenylpropane
or
1-(9′-Fluoryl)-2-phenylethane
α-9-Fluoryl-β-phenylethane

Among the incorrectly used names are chrysofluorene and dinaphthofluorenes. These terms imply a chryso- and two naphtho-fusions, respectively, on fluorene but are used almost exclusively in reference to benzo- and dibenzofluorenes.

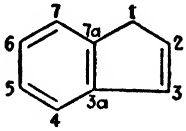


Chrysofluorene
α-Naphthofluorene
1,2-Benzofluorene

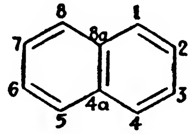


β,β-Dinaphthofluorene
2,3,6,7-Dibenzofluorene

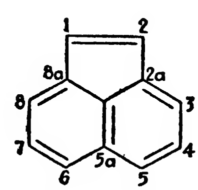
The explanation of the nomenclature used in the present study begins with consideration of nuclear structures. The following compounds with the indicated numbering are used as standard nuclei from which more complicated structures are built:



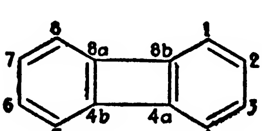
Indene
(2,3-dihydro form: Indane)



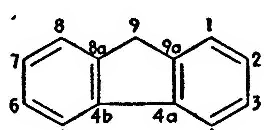
Naphthalene



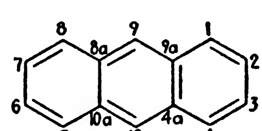
Acenaphthylene
(1,2-dihydro form: Acenaphthene)



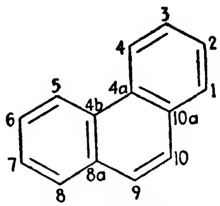
Biphenylene



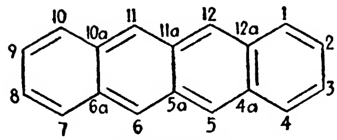
Fluorene



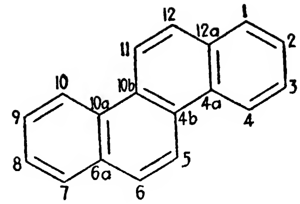
Anthracene



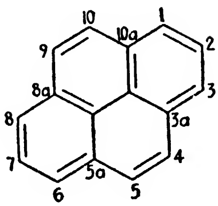
Phenanthrene



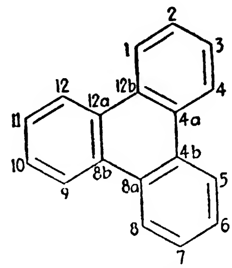
Naphthacene



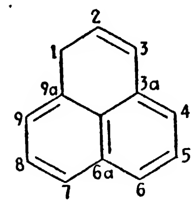
Chrysene



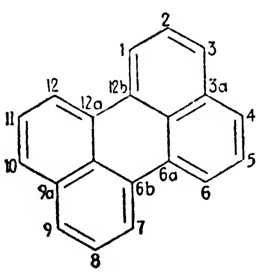
Pyrene



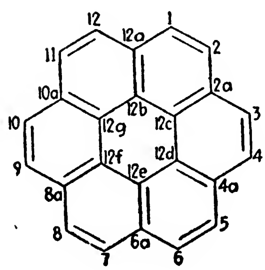
Triphenylene



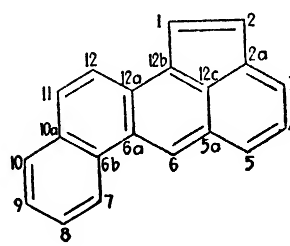
Phenalene
(2,3-dihydro form:
Phenalan)



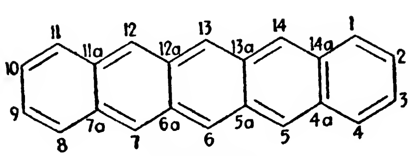
Perylene



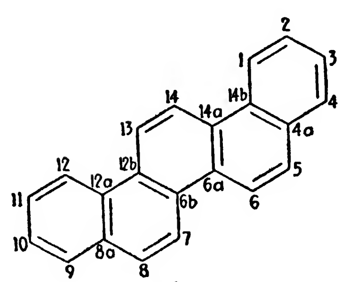
Coronene



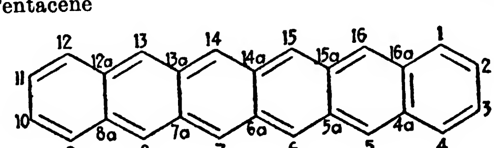
Cholanthrylene
(1,2-dihydro form:
Cholanthrene)



Pentacene

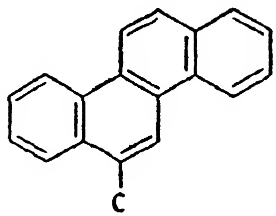


Picene



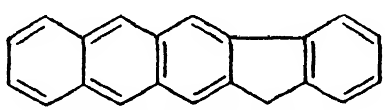
Hexacene

The least hydrogenated forms are considered parent except for the specified dihydro forms of indene, acenaphthylene, phenalene, and cholanthrylene. The largest of these nuclei contained in a given compound is considered as the nuclear structure of that compound. For example, the following structure is named 6-methylchrysene in preference to 1,2-benzo-3-methylphenanthrene.



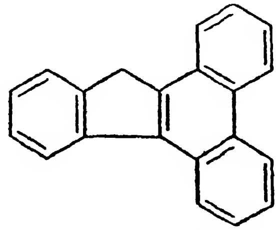
6-Methylchrysene

Because anthracene is a larger nucleus then fluorene, 2,3-(3',2'-indo)-anthracene rather than 2,3-(3',2'-naphtho)-fluorene is assigned to the following structure.



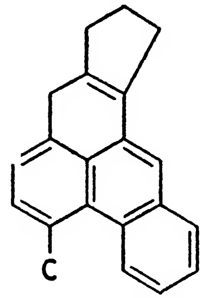
2,3-(3',2'-Indo)-anthracene

Exception to this ruling is made, however, when the exception results in a decided simplification of the name. Prime numbering, for example, can be eliminated by naming the following structure 1,2,3,4-dibenzofluorene instead of 9,10-(2',3'-indo)-phenanthrene.



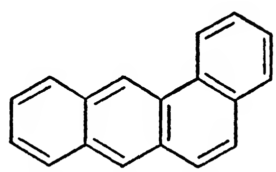
1,2,3,4-Dibenzofluorene

Likewise, 2,3-cyclopentano-5,6-benzo-7-methylphenalene includes only one set of numbers while cyclopentano-[a]-(6'-methylbenzo)-[de]-3-hydroanthracene necessitates the use of letters and two sets of numbers.



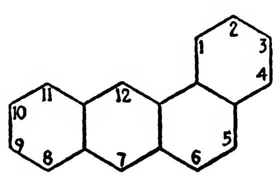
2,3-Cyclopentano-5,6-benzo-7-methylphenalene

When two parent nuclei of the same size are possible, the one having the greatest number of rings in a horizontal row is chosen as the parent nucleus. For example, 1,2-benzoanthracene is preferred to 2,3-benzophenanthrene.



1,2-Benzoanthracene

Many authors number compounds such as 1,2-benzoanthracene with a single set of numbers.



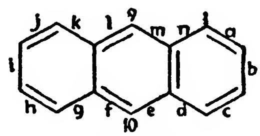

1,2-Benzoanthracene[1]

Although this system is advantageous in many respects, it brings in complications when derivative compounds are named. According to this plan, a methyl radical substituted on the benzo group has the number 2-, 3-, or 4- which is ambiguous because 1- and 2- are also used to describe the position of the benzo group on anthracene.

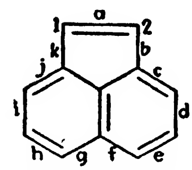
The positions of fused substituents cannot be indicated by numerical notations with simplicity when more than one side of the substituent is common to the parent nucleus. In these cases, letters designate the sides of fusion. The letter "a" represents the side between the 1- and 2-positions, "b" the next side

[1] Patterson, A. M., and L. T. Capell, "The Ring Index," Reinhold Publishing Corporation, New York, **1940.**

of the formula and so on in alphabetical order. The positions described by letters are illustrated in the following:

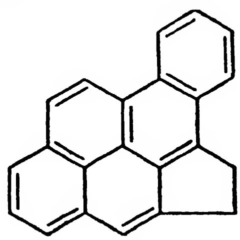


Anthracene



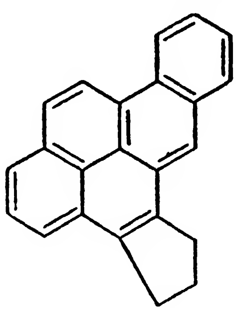
Acenaphthylene

When a compound has two or more fused substituents, only one of which can be designated by numbers, letters are used for all.



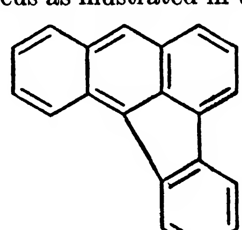
Benzo-[a]-cyclopentano-[cd]-pyrene
not
1,2-Benzocyclopentano-[cd]-pyrene

When all fused substituents are fused to only one side of the nucleus, the positions are indicated by numbers rather than letters.

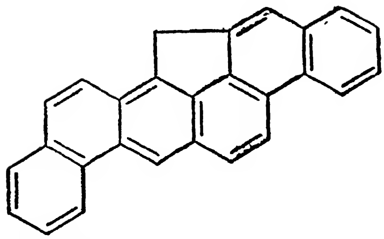


1,2-Benzo-4,5-cyclopentanopyrene
not
Benzo-[a]-cyclopentano-[e]-pyrene

All fused substituents other than benzene which require the use of letters, must have a second series of letters or a set of numbers to indicate the positions of carbons relative to the substituent itself. These positions are stated in numbers and are inscribed within brackets preceding the letters used to designate the position of fusion on the nucleus as illustrated in the following examples.

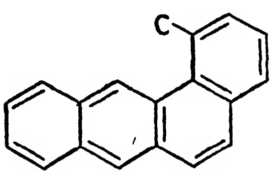


Indo-[3,2,1-de]-anthracene



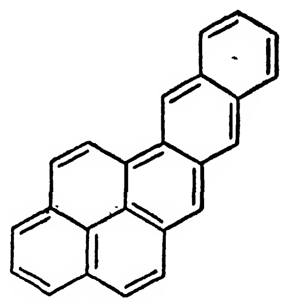
Naphtho-[3,2,1-bc]-cholanthrene

All numbering and lettering is clockwise except for a few instances which will be explained later.[1] The initial point of numbering on the substituent nucleus is situated so that the carbon atoms common to both the parent and substituent nuclei have the lowest possible numbers consistent with standard numbering. Thus the nomenclature for the following structures is:



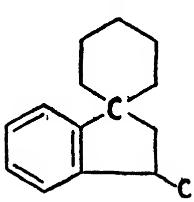


1,2-(3′-Methylbenzo)-anthracene
not
6,7-(3′-Methylbenzo)-anthracene



1,2-(3′,2′-Naphtho)-pyrene
not
6,7-(3′,2′-Naphtho)-pyrene

For spiro compounds, essentially the same rules apply and the spiro atom is assigned the lowest possible number.

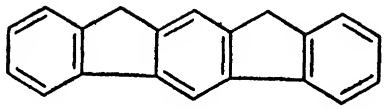




Spiro [3-methylindane-1,1′-cyclohexane]
not
Spiro [1-methylindane-3,1′-cyclohexane]

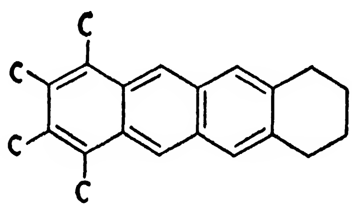
Counterclockwise numbering is used for substituent nuclei when clockwise numbering involves a change in the standard numbering. For example, the use of clockwise numbers for the indo-substituent of 2,3-(2′,3′-indo)-fluorene would involve numbering the saturated carbon as 3′- rather than 1′-, the standard position.

[1] See Patterson and Capell, "The Ring Index" p. 24. The formula for 7-benz-[de]-anthracene is numbered clockwise but lettered counter clockwise. Many examples similar to this are found in the names of preference given in "The Ring Index."



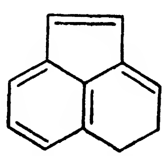
2,3-(2′,3′-Indo)-fluorene

The principle of assigning the lowest possible numbers or letters to substituents is followed in this volume as it is for the mononuclear aromatics. For detailed explanation of alkyl and alicyclic derivatives, see the Introduction to Volume III. The problems encountered in numbering the various nuclei of this volume complicate somewhat the general application of the system used for the mononuclears. The nuclear systems must be numbered in accordance with the previous discussion before the rules for using lowest possible numbers are applied. In this volume, there is an exception to this rule. When a partially hydrogenated nuclear structure can be numbered from more than one starting point, the hydrogenated positions are always assigned the lowest numbers. In the naming of the compound, these hydrogen atoms are designated immediately preceding the name of the nuclear structure even though the numbers referring to other substituents are higher.



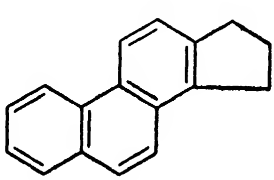
7,8,9,10-Tetramethyl - 1,2,3,4-tetrahydro-naphthacene
not
1,2,3,4-Tetramethyl - 7,8,9,10-tetrahydro-naphthacene
nor
1,2,3,4-Tetrahydro - 7,8,9,10-tetramethyl-naphthacene

This rule is not followed, however, when assignment of lowest numbers to the hydrogen atoms involves changing of the standard numbering of a ring system.



4,5-Dihydroacenaphthylene
not
1,2-Dihydroacenaphthylene

Frequently in the literature, a cyclane fused to an aromatic nucleus was names as a cycleno-compound. Although the side common to the nucleus and the substituent has, at least in some of the resonance structures, a double bond, the substituent is called cyclano- in this volume. For example, the following structure is named 1,2-cyclopentanophenanthrene even though it is frequently referred to as a 1,2-cyclopentenophenanthrene in the literature.

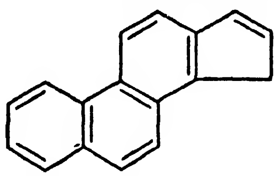


1,2-Cyclopentanophenanthrene

Assuming other resonance structures of phenanthrene, a double bond will not always exist on the common side.

Two other resonance structures for 1,2-Cyclopentanophenanthrene

By naming the five carbon ring cyclopentano-, confusion is avoided with such structures as 1,2-(cyclopenten-3′-o)-phenanthrene.

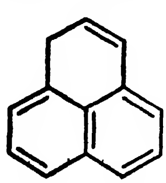


1,2-(Cyclopenten-3′-o)-phenanthrene

If cyclopenteno- were used for the former structure, cyclopentadieno- would necessarily be used for the latter.

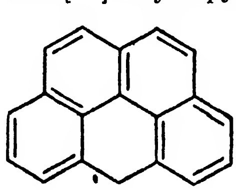
The notation of all possible resonance structures is not practical for this publication. Inclusion of double bonds in the formulae, however, is necessary to indicate the extent of saturation. Double bonds are, therefore, assigned arbitrarily in order to distinguish partially hydrogenated compounds from the others.

*Peri-* fused benzene ring structures, of which phenalene is the simplest, always have one saturated carbon atom.



Phenalene

In this study, the name given to such compounds, except for those included in the list of nuclear structures, specifies the saturated carbon atom by prefixing the appropriate number to -hydro-. For example, the following compound is named benzo-[cd]-5-hydropyrene.



Benzo-[cd]-5-hydropyrene

## Order of Tabulating Compounds

The order used for the tabulation in this volume will be explained to facilitate the location of compounds. Constants have been determined on a wide variety of nuclear structures and derivatives thereof. For only a few nuclear structures, however, have sufficient derivatives of one type (*i.e.* alkyl, alkenyl, phenyl, diphenyl, etc.) been prepared to warrant the classification of these into a separate section. Consequently, a highly arbitrary system is devised for the classification and the order of listing compounds.

All compounds having a common empirical formula are classified in one group. These groups are numbered with Roman numerals and listed in order of decreasing hydrogen content. All compounds of empirical formula $C_nH_{2n-8}$, for example, are tabulated under I; compounds of formula $C_nH_{2n-10}$ are listed under II, etc.

Groups I through XV are divided into sections denoted by Arabic numerals. These subdivisions are made when a lengthy series of compounds having a single nuclear structure or very similar nuclear structures is found. The section including the smallest nuclear structure is tabulated under 1., the next under 2., etc. Thus under Group VII are listed:

1. Indene derivatives of empirical formula $C_nH_{2n-20}$.
2. Naphthalene derivatives of empirical formula $C_nH_{2n-20}$.
3. Cyclanoanthracenes and their alkyl derivatives.
4. Cyclanophanenthrenes and their alkyl derivatives.
5. Miscellaneous polynuclears of empirical formula $C_nH_{2n-20}$.

When nuclei of two or more sections are of the same size, the section composed of derivatives of the nucleus having the longest straight row of rings precedes the others. Under Group IX, for example, section 5 is naphthacene and its alkyl derivatives, section 6 is chrysene and its alkyl derivatives, etc.

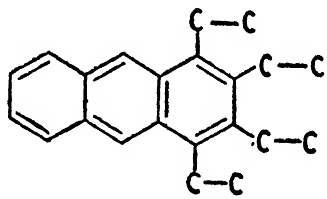
Except for sections entitled miscellaneous and a few sections in which general classification is simplified by listing together such similar compounds as anthracene and phenanthrene derivatives, the compounds of one section have a common nucleus. The compounds are listed in these sections:

1. In increasing order of carbon content, *i.e.* $C_{12}$ compounds precede $C_{13}$ compounds etc.
2. In order of increasing number of substituents, *i.e.* propyl precedes methyl plus ethyl which precedes trimethyl.
3. In order of increasing complexity of substituents, *i.e.* *n*-butyl precedes *sec*-butyl which precedes *tert*-butyl. For more detailed explanation see Introduction to Volume III.
4. In order of increasing numerical sum of the numbers describing substituent positions, *i.e.* 2,3,5-trimethylnaphthalene precedes 1,2,8-trimethylnaphthalene. If the sum is equal, the compound bearing the lowest number is placed first, *i.e.* 1,4-dimethylnaphthalene precedes 2,3-dimethylnaphthalene.

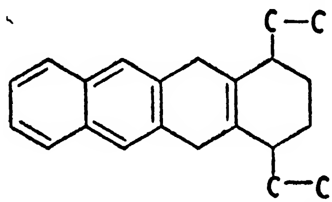
The order of tabulating compounds in the miscellaneous groups or sections

is more complicated. These hydrocarbons are listed primarily in order of increasing carbon content. After this qualification has been fulfilled, the general order follows:

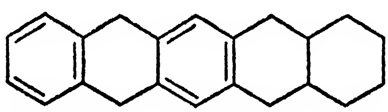
1. In order of increasing number of rings, *i.e.*, anthracene derivatives precede hexahydronaphthacene derivatives which precede decahydropentacene etc.



(1) 1,2,3,4-Tetraethylanthracene

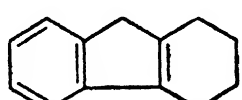


(2) 1,4-Diethyl-1,2,3,4,5,12-hexahydronaphthacene

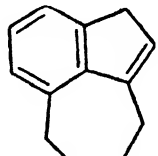


(3) 1,2,3,4,4a,5,7,12,14,14a-Decahydropentacene

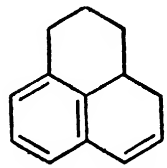
2. In order of increasing size of rings, *i.e.* a compound having one five- and two six-membered rings precedes one having one five-, one six-, and one seven-membered rings which precedes one having three six-membered rings.



(1) 1,2,3,4-Tetrahydrofluorene (1–5C and 2–6C rings)

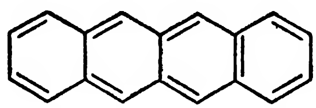


(2) Cycloheptano-[cd]-indene (1–5C, 1–6C and 1–7C rings)

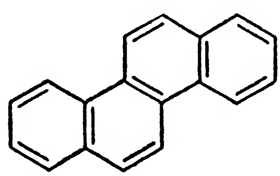


(3) 3a,4-Dihydrophenalan (3–6C rings)

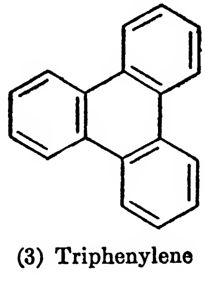
3. In order of increasing number of rings fused at angles, *i.e.*, naphthacene precedes chrysene which precedes triphenylene, etc.



(1) Naphthacene



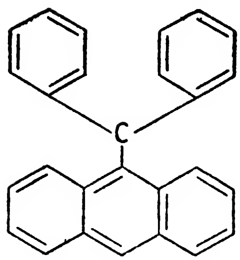
(2) Chrysene



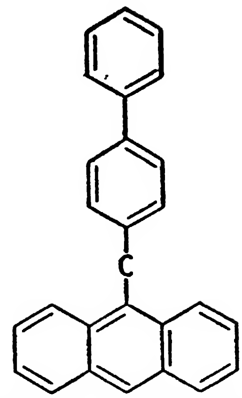
(3) Triphenylene

The foregoing general principles, however, are not sufficient for determining order in every case. Further discussion follows to clarify special problems which arise after the general principles have been followed.

Benzhydrylpolynuclears precede polynuclear biphenylylmethane. For example, 9-benzhydrylanthracene precedes 9-anthryl-*p*-biphenylylmethane.

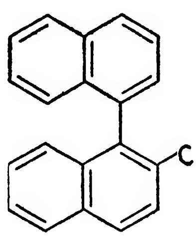


(1) 9-Benzhydrylanthracene

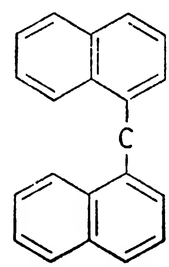


(2) 9-Anthryl-*p*-biphenylylmethane

Biaryls are listed preceding diarylaliphatics, *i.e.*, 2-methyl-1,1′-binaphthyl precedes di-1-naphthylmethane.

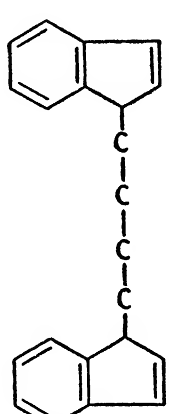


(1) 2-Methyl-1,1′-binaphthyl

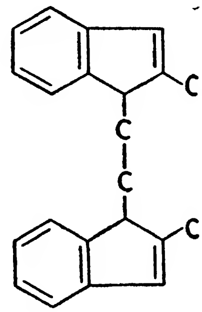


(2) Di-1-naphthylmethane

Diarylaliphatics, however, precede dialkyldiarylaliphatics. Thus 1,4-di-(1′-indenyl)-butane is listed before 1,2-di-[1′-(2′-methylindenyl)]-ethane.

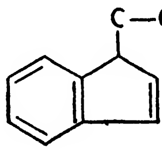


(1) 1,4-Di-(1′-indenyl)-butane

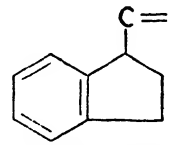


(2) 1,2-Di-[1′-(2′-methylindenyl)]-ethane

When two polynuclear nuclei have the same carbon structure, the least hydrogenated nucleus is tabulated first. As an illustration, 1-ethylindene precedes 1-ethenylindane.

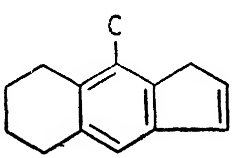


(1) 1-Ethylindene

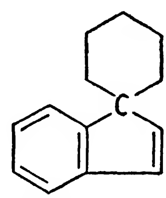


(2) 1-Ethenylindane

Spiro compounds follow others having rings of equivalent number and size. Both 7-methyl-5,6-cyclohexanoindene and spiro [indene-1,1′-cyclohexane] have fourteen carbon atoms and are named with reference to indene as the largest nucleus. They also have an equivalent number of rings of the same size. According to our arbitrary decision, the spiro compound is listed last.

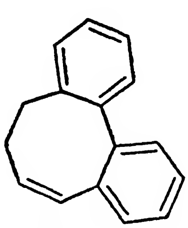


(1) 7-Methyl-5,6-cyclohexanoindene
(1–5C and 2–6C rings)

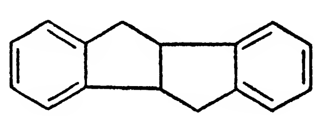


(2) Spiro [indene-1,1′-cyclohexane]
(1–5C and 2–6C rings)

In the assignment of positions in the present tabulation, *endo-* and *bicyclo-* structures are considered to be two rings. A dibenzocyclooctene, therefore, would precede a dibenzobicyclooctane because the latter has four rings (2–5C and 2–6C) while the former has only three rings (1–8C and 2–6C).

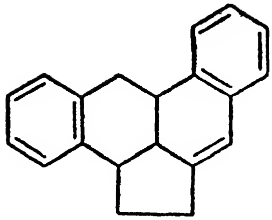


(1) 1,2,3,4-Dibenzocyclooctene-5

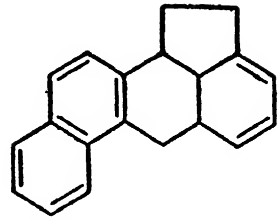


(2) 2,3,6,7-Dibenzobicyclo-[3,3,0]-octane

When two compounds have the same number of rings of the same size, but are not named as derivatives of the same nucleus, the compound having the name with the smallest parent nucleus is tabulated first. For example, benzo-[a]-cyclopentano-[de]-4a,9,9a,10-tetrahydroanthracene precedes 5a,6,12b,12c-tetrahydrocholanthrene.

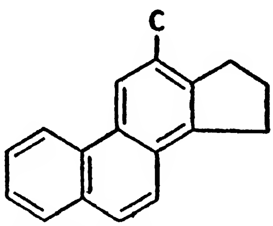


(1) Benzo-[a]-cyclopentano-[de]-4a,9,9a,10-tetrahydroanthracene

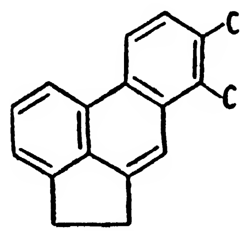


(2) 5a,6,12b,12c-Tetrahydrocholanthrene

When two compounds have nominally identical ring structures, but one compound has a larger ring structure because of the difference in position of a fused substituent, the compound having the least total substituents is recorded first. For example, 1,2-cyclopentano-3-methylphenanthrene precedes cyclopentano-[jk]-1,2-dimethylphenanthrene.



(1) 1,2-Cyclopentano-3-methyl-phenanthrene



(2) Cyclopentano-[jk]-1,2-dimethylphenanthrene

A review of the Introduction to Volume III is suggested to clarify the order of tabulation of compounds when aliphatic and alicyclic substituents are involved.

I. BENZOCYCLANES, $C_n H_{2n-8}$

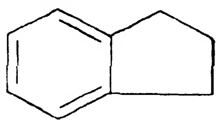
1. Indane and Its Alkyl Derivatives
2. Tetrahydronaphthalene and Its Alkyl Derivatives
3. Higher Benzocyclanes

# 1. INDANE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-8}$

## $C_9H_{10}$

**Indane**

(Hydrindene)



**M. P., °C**

−51.4[12]

**B. P., °C @ 760mm**

177
176–180[44]
177.5–178.5[13]
177–178[30]
175.5–177.5[53]
177.0[33]
177[14, 27, 29]
176–177[34]
176–176.5[52]
176.25[33]
176[2, 47]
174–176[19, 23]

| | |
|---|---|
| 177–181 | 771[28] |
| 177–178 | 764[25] |
| 176–176.5 | 762[22] |
| 174–174.5 | 751.5[26] |
| 176–176.5 | 742[8] |
| 79.0 | 29[12] |
| 51 | 14[38] |
| 66.5 | 13[21] |
| 55 | 11[40] |

$D_4^{20}$

| | |
|---|---|
| 0.9639[13] | |
| 0.9645[2] | |
| 0.8942 | 100° [13] |
| 0.9378 | 50° [13] |
| 0.9560 | 25° [40] |
| 0.9599 | 25° [40] |
| 0.9507 | $D_{25}^{25}$ [33, 34] |
| 0.9559 | $D_{25}^{25}$ [34] |
| 0.9582 | $D_{25}^{25}$ [33] |
| 0.9536 | $D_{20}^{20}$ [33, 34] |
| 0.9601 | $D_{20}^{20}$ [33] |
| 0.9611 | $D_{20}^{20}$ [34] |
| 0.9547 | 19.5° [53] |
| 0.96250 | 16.4° [33] |
| 0.957 | 15° [22, 52] |
| 0.9570 | $D_{15}^{15}$ [33, 34] |
| 0.960 | $D_{15}^{15}$ [19] |
| 0.9645 | $D_{15}^{15}$ [33, 34] |
| 0.95980 | 10.6° [33] |
| 0.9606 | $D_{10}^{10}$ [34] |
| 0.9681 | $D_{10}^{10}$ [33, 34] |
| 0.9646 | $D_5^5$ [33] |
| 0.9723 | $D_5^5$ [33] |
| 0.9656 | $D_4^4$ [33] |
| 0.9732 | $D_4^4$ [33] |
| 0.9813 | 0° [13] |

$n_D^{20}$

| | |
|---|---|
| 1.5381[2] | |
| 1.5383[13] | |
| 1.5352 | 25° [40] |
| 1.5355 | 25° [40] |
| $1.5351_2$ | 20.8° [9] |
| 1.5382 | 20.7° [12] |
| 1.53877 | 19.25° [34] |
| 1.5381 | 17.9° [21] |
| 1.53877 | 16.4° [33] |
| 1.53896 | 15.95° [34] |
| 1.5407 | 15° [13] |
| $1.5303_8$ | $n_{H\alpha}^{20.8}$ [9] |
| 1.53394 | $n_{H\alpha}^{19.25}$ [34] |
| 1.53394 | $n_{H\alpha}^{16.4}$ [33] |
| 1.53431 | $n_{H\alpha}^{15.95}$ [34] |
| 1.53431 | $n_{H\alpha}^{10.6}$ [33] |

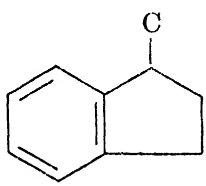
| | |
|---|---|
| $1.5471_3$ | $n_{H\beta}^{20.8}$ [9] |
| 1.55114 | $n_{H\beta}^{19.25}$ [34] |
| 1.55114 | $n_{H\beta}^{16.4}$ [33] |
| 1.55105 | $n_{H\beta}^{15.95}$ [34] |
| 1.55105 | $n_{H\beta}^{10.6}$ [33] |
| 1.56136 | $n_{H\gamma}^{19.25}$ [34] |
| 1.56136 | $n_{H\gamma}^{16.4}$ [33] |
| 1.56154 | $n_{H\gamma}^{15.95}$ [34] |
| 1.56154 | $n_{H\gamma}^{10.6}$ [33] |

(a)

(a) Refractive indices at other lines are found in references 33, 34.

## $C_{10}H_{12}$

### 1-Methylindane



B. P., °C @ 760mm

| | |
|---|---|
| 186–187[31] | |
| 182–183[16] | |
| 182[47] | |
| 60–64 | 12[40] |
| 60 | 10[40] |

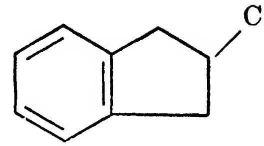
$D_4^{20}$

| | |
|---|---|
| 0.940[37] | |
| 0.9402[40] | |
| 0.9407[31] | |
| 0.9383 | 25° [40] |
| 0.947 | 21° [40] |
| 0.9661 | 16° [46] |

$n_D^{20}$

| | |
|---|---|
| 1.5222[40] | |
| 1.5260[37] | |
| 1.52742[31] | |
| 1.5204 | 25° [40] |
| 1.53938 | 16° [46] |

### 2-Methylindane



B. P., °C @ 760mm

| | |
|---|---|
| 183–185 | 747[20] |
| 70 | 10[40] |
| 69 | 10[37, 40] |

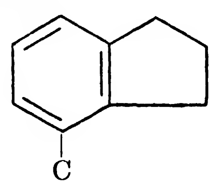
$D_4^{20}$

| | |
|---|---|
| 0.932[37] | . |
| 0.9317 | 25° [40] |
| 0.9318 | 23° [40] |
| 0.9321 | 22° [40] |
| 0.9034 | $D_0^{17}$ [20] |

$n_D^{20}$

| | |
|---|---|
| 1.5235[37] | |
| 1.5189 | 25° [40] |
| 1.5200 | 23° [40] |
| 1.5224 | 22° [40] |

### 4-Methylindane



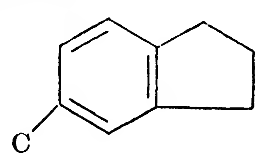
B. P., °C @ 760mm

203[24]

$D_4^{20}$

0.9350[24]

### 5-Methylindane



B. P., °C @ 760mm

| | |
|---|---|
| 74 | 11[35] |

$D_4^{20}$

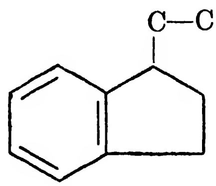
0.9494[35]

$n_D^{20}$

1.5332[35]

## $C_{11}H_{14}$

### 1-Ethylindane



B. P., °C @ 760mm

| | |
|---|---|
| 212[39] | |
| 84 | 12[40] |

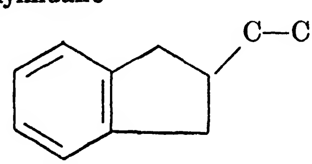
$D_4^{20}$

| | |
|---|---|
| 0.9348 | 25° [39] |
| 0.9346 | 23° [40] |

$n_D^{20}$

| | |
|---|---|
| 1.5202 | 23° [40] |
| 1.52286 | $n_{He}^{25}$ [39] |

### 2-Ethylindane



B. P., °C @ 760mm

| | |
|---|---|
| 86 | 12[40] |

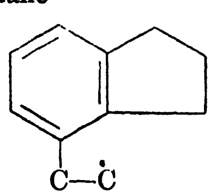
$D_4^{20}$

| | |
|---|---|
| 0.9266 | 24° [40] |

$n_D^{20}$

| | |
|---|---|
| 1.5160 | 24° [40] |

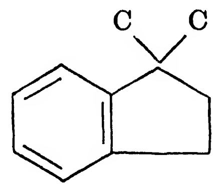
### 4-Ethylindane



B. P., °C @ 760mm

| | |
|---|---|
| 125–130 | 43[5] |
| 71–72 | 2.5[5] |

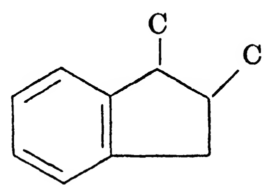
### 1,1-Dimethylindane



B. P., °C @ 760mm

191[1]

### 1,2-Dimethylindane



B. P., °C @ 760mm

| | |
|---|---|
| 79.80 | 10[37] |

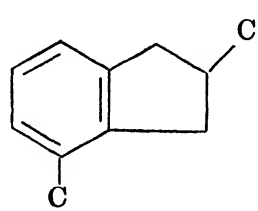
$D_4^{20}$

0.927[37]

$n_D^{20}$

1.5186[37]

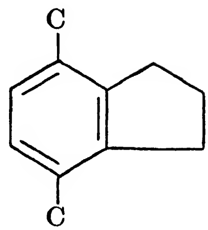
### 2,4-Dimethylindane



B. P., °C @ 760mm

| | |
|---|---|
| 105–106 | 25[4] |
| 100–105 | 23[3] |

### 4,7-Dimethylindane



B. P., °C @ 760mm

| | |
|---|---|
| 94–97 | 10[37] |
| 94 | 10[36] |

$D_4^{20}$

0.949[37]

$n_D^{20}$

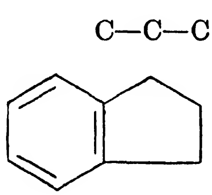
1.5342[37]

1.5346[36]

---

## $C_{12}H_{16}$

### 1-Isopropylindane

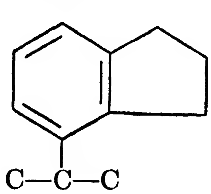


B. P., °C @ 760mm

| | |
|---|---|
| 98–100 | 17[10] |

---

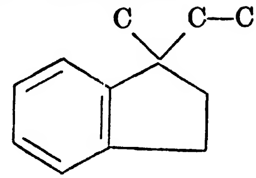
### 4-Isopropylindane



B. P., °C @ 760mm

| | |
|---|---|
| 88–90 | 1[3,6] |

### 1-Methyl-1-ethylindane



B. P., °C @ 760mm

218[39]

$D_4^{20}$

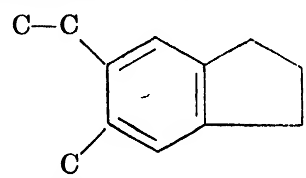
| | |
|---|---|
| 0.9232 | 25°[39] |

$n_D^{20}$

| | |
|---|---|
| 1.51563 | $n_{He}^{25}$[39] |

---

### 5-Methyl-6-ethylindane

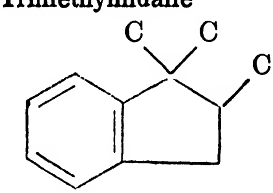


B. P., °C @ 760mm

| | |
|---|---|
| 112–116 | 11[A] |

---

### 1,1,2-Trimethylindane



B. P., °C @ 760mm

208[1,11]

$D_4^{20}$

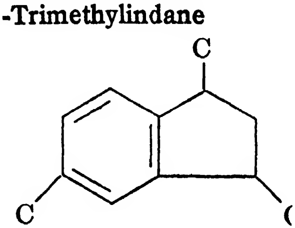
0.919[11]

$n_D^{20}$

1.5137[11]

---

### 1,3,5-Trimethylindane



B. P., °C @ 760mm

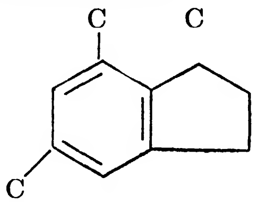
98–99 14[51]

$n_D^{20}$

1.5206[51]

---

**1,5,7-Trimethylindane**



B. P., °C @ 760mm

104–105 14[50]

$n_D^{20}$

1.5231 25° [50]

---

## $C_{13}H_{18}$

**x-Butylindane** (a)

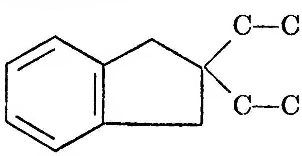
B. P., °C @ 760mm

238[32]

(a) The structure of this compound was not clearly defined in the literature.

---

**2,2-Diethylindane**



B. P., °C @ 760mm

118 16[17]

$D_4^{20}$

0.9162[17]

0.9295 13.4° [45]

$n_D^{20}$

1.5135 25° [17]

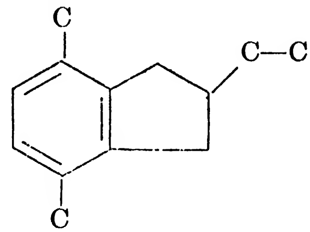
1.51406 $n_{H\alpha}^{13.4}$ [45]

1.52792 $n_{H\beta}^{13.4}$ [45]

1.53643 $n_{H\gamma}^{13.4}$ [45]

1.51820 $n_{He}^{13.4}$ [45]

**2-Ethyl-4,7-dimethylindane**



B. P., °C @ 760mm

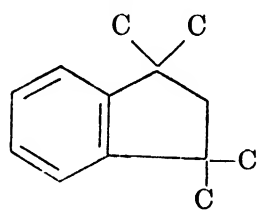
84–85 0.1[49]

$n_D^{20}$

1.5207 22° [49]

---

**1,1,3,3-Tetramethylindane**



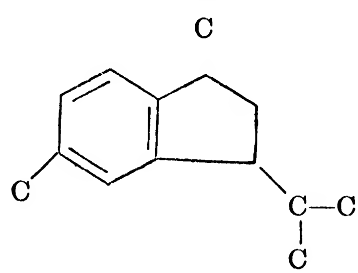
B. P., °C @ 760mm

206–209[1]

---

## $C_{14}H_{20}$

**1,5-Dimethyl-3-isopropylindane**



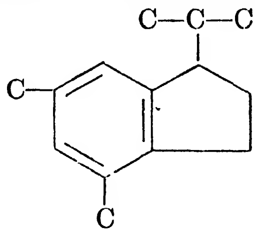
B. P., °C @ 760mm

115–16 10[51]

$n_D^{20}$

1.5179 21° [51]

### 1-Isopropyl-4,6-dimethylindane



B. P., °C @ 760mm

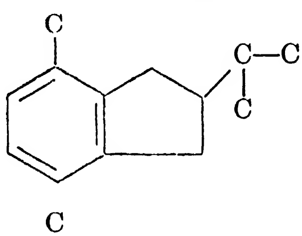
| | |
|---|---|
| 118–120 | 0.3 [48] |

$n_D^{20}$

| | |
|---|---|
| 1.5215 | 22.5° [48] |

---

### 2-Isopropyl-4,7-dimethylindane



M. P., °C

23–24 [41]

B. P., °C @ 760mm

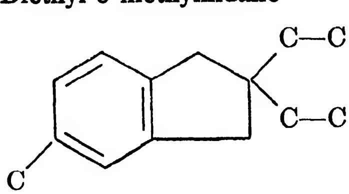
| | |
|---|---|
| 108–110 | 3 [41] |

$n_D^{20}$

1.518 [41]

---

### 2,2-Diethyl-5-methylindane



B. P., °C @ 760mm

| | |
|---|---|
| 123–127 | 12 [15] |

$D_4^{20}$

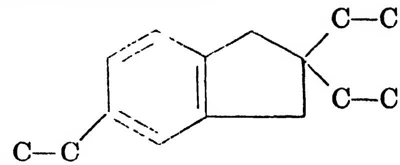
| | |
|---|---|
| 0.9197 | 21.5° [15] |

$n_D^{20}$

1.51055 [15]

## $C_{15}H_{22}$

### 2,2,5-Triethylindane



$D_4^{20}$

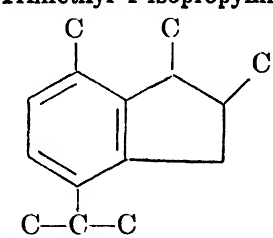
| | |
|---|---|
| 0.9178 | 16.2° [45] |
| 0.9250 | 14.05° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.51081 | $n_{\mathrm{H}\alpha}^{16.2}$ [45] |
| 1.51323 | $n_{\mathrm{H}\alpha}^{14.05}$ [45] |
| 1.52426 | $n_{\mathrm{H}\beta}^{16.2}$ [45] |
| 1.52679 | $n_{\mathrm{H}\beta}^{14.05}$ [45] |
| 1.53242 | $n_{\mathrm{H}\gamma}^{16.2}$ [45] |
| 1.53522 | $n_{\mathrm{H}\gamma}^{14.05}$ [45] |
| 1.51473 | $n_{\mathrm{He}}^{16.2}$ [45] |
| 1.51741 | $n_{\mathrm{He}}^{14.05}$ [45] |

---

### 1,2,7-Trimethyl-4-isopropylindane



B. P., °C @ 760mm

| | |
|---|---|
| 154–155 | 29 [7] |

$D_4^{20}$

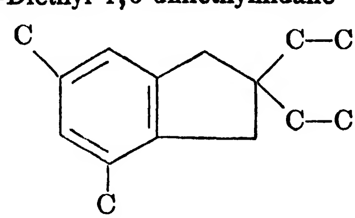
| | |
|---|---|
| 0.9250 | $D_{25}^{25}$ [7] |

$n_D^{20}$

| | |
|---|---|
| 1.5112 | 25° [7] |

---

### 2,2-Diethyl-4,6-dimethylindane



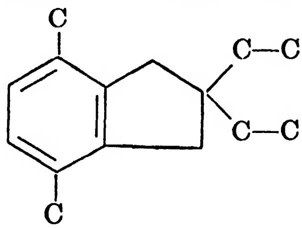
B. P., °C @ 760mm

265–270[18]

260–265[18]

---

**2,2-Diethyl-4,7-dimethylindane**



B. P., °C @ 760mm

| | |
|---|---|
| 140–141 | 13[16] |

$D_4^{20}$

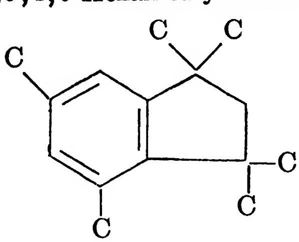
0.923[16]

$n_D^{20}$

1.51592[16]

---

**1,1,3,3,4,6-Hexamethylindane**



B. P., °C @ 760mm

| | |
|---|---|
| 114–117 | 13[43] |

$D_4^{20}$

| | |
|---|---|
| 0.901 | 31° [43] |
| 0.905 | $D_{31}^{31}$ [43] |

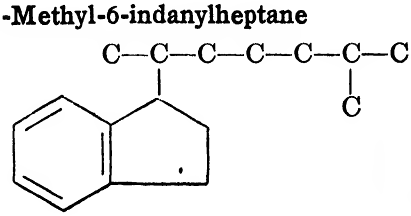
$n_D^{20}$

| | |
|---|---|
| 1.5100 | 28.5° [43] |

---

## $C_{17}H_{26}$

**2-Methyl-6-indanylheptane**



B. P., °C @ 760mm

| | |
|---|---|
| 100–102 | 0.2[40] |

$D_4^{20}$

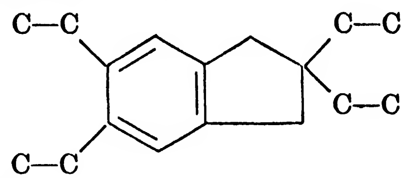
| | |
|---|---|
| 0.9083 | 19° [40] |

$n_D^{20}$

| | |
|---|---|
| 1.5065 | 19° [40] |

---

**2,2,5,6-Tetraethylindane**



$D_4^{20}$

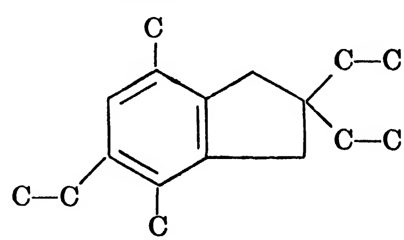
| | |
|---|---|
| 0.9246 | 14.35° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.51582 | $n_{H\alpha}^{14.35}$ [45] |
| 1.52935 | $n_{H\beta}^{14.35}$ [45] |
| 1.53776 | $n_{H\gamma}^{14.35}$ [45] |
| 1.51998 | $n_{He}^{14.35}$ [45] |

---

**2,2,5-Triethyl-4,7-dimethylindane**



B. P., °C @ 760mm

| | |
|---|---|
| 163–164 | 14[17] |

$D_4^{20}$

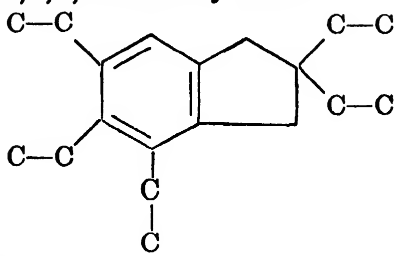
0.916[17]

$n_D^{20}$

1.51592[17]

## $C_{19}H_{30}$

### 2,2,4,5,6-Pentaethylindane



$D_4^{20}$

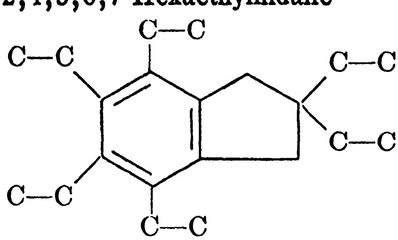
| | |
|---|---|
| 0.9234 | 14.1° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.51702 | $n_{H\alpha}^{14.1}$ [45] |
| 1.53043 | $n_{H\beta}^{14.1}$ [45] |
| 1.53878 | $n_{H\gamma}^{14.1}$ [45] |
| 1.52115 | $n_{H\delta}^{14.1}$ [45] |

## $C_{21}H_{34}$

### 2,2,4,5,6,7-Hexaethylindane



$D_4^{20}$

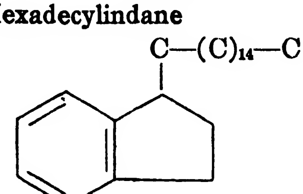
| | |
|---|---|
| 0.9263 | 14.3° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.51856 | $n_{H\alpha}^{14.3}$ [45] |
| 1.53198 | $n_{H\beta}^{14.3}$ [45] |
| 1.54022 | $n_{H\gamma}^{14.3}$ [45] |
| 1.52265 | $n_{H\delta}^{14.3}$ [45] |

## $C_{25}H_{42}$

### 1-*n*-Hexadecylindane



M. P., °C

33.1[42]

B. P., °C @ 760mm

| | |
|---|---|
| 206.5 | 1.00[42] |
| 191.5 | 0.50[42] |

$D_4^{20}$

| | |
|---|---|
| 0.8333 | 98.9° [42] |
| 0.8587 | 60° [42] |
| 0.8738 | 37.8° [42] |

$n_D^{20}$

| | |
|---|---|
| 1.4941[42] | |
| 1.4863 | 40.0° [42] |
| 1.4902 | 30.0° [42] |

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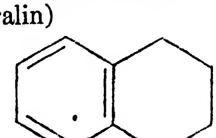
## 2. TETRAHYDRONAPHTHALENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-8}$

### $C_{10}H_{12}$

**1,2,3,4-Tetrahydronaphthalene**
(Tetralin)



M. P., °C

−35.8
−30−−27[60]
−30[51, 52]
−31[33]
−35.0 ± 0.5[23]

−36.22(a)[38]
−36.3[12, 13]

B. P., °C @ 760mm

**207.4**
208[25, 33, 51, 73]
206–208[60]
205–208[6, 52, 57]
207.66[38]
207.6[54]
207.3[23]
207.1[23]
207.0[12]
207[14, 79]
206.6–207.0[18]
206.5–207.0[82]
206.5–207[37]
206–207[47]
205–207 (b)
206[10, 21, 34, 48, 61, 83]
204–206[30]
205.4–205.8[32]
205.7[62]
205 (c)
204–205[9, 44, 49, 81]

| | |
|---|---|
| 207.6 | 768.66[23] |
| 206–207 | 764[70] |
| 207 | 763[77] |
| 206.8 ± 0.2 | 759[7] |
| 206.5 | 755[60] |
| 206.6 | 751.28[23] |
| 206.2 | 740[23] |
| 204–205 | 722[4] |
| 204.0–204.5 | 716.3[82] |
| 204.5–205 | 716[3] |
| 205–207 | 708[2] |
| 167.5 | 273[23] |
| 150.0 | 162[23] |
| 148.6 | 147.2[19] |
| 140.0 | 118[23] |
| 126.9 | 76.0[23] |
| 126.6 | 67.8[19] |
| 116.8 | 52.5[23] |
| 105.2 | 36[75] |
| 103.0 | 30[23] |
| 100–101 | 25[60] |
| 101.1 | 22.8[19] |
| 96 | 21[64] |
| 93.8 | 20[23] |
| 90.8–91.2 | 17[65, 70] |
| 89 | 12[26] |
| 75.5 | 7.2[19] |
| 75.1 | 7.1[19] |
| 74.4 | 7.0[19] |
| 71–72 | 6[41] |
| 54.0 | 2.2[19] |
| 52–55 | 2[46] |
| 49.4 | 1.9[19] |
| 48.9 | 1.9[19] |
| 46.6 | 1.7[19] |
| 65.0 | 0.83[35] |
| 41.8 | 0.7[19] |
| 40.8 | 0.7[19] |
| 40.1 | 0.6[19] |
| 39.3 | 0.5[19] |
| 25.0 | 0.40[35] |
| 20 | 0.263[50] |
| 20 | 0.26[50] |
| −1.2 | 0.0235[35] |
| −2.4 | 0.015[35] |

$D_4^{20}$

**0.9702**
0.966[34, 83]
0.9663[77]
0.9681[45]
0.9705[38]
0.9706[65]
0.9707[18]
0.971[66, 67, 71]
0.9712[82]
0.9714[77]
0.972[47, 63]
0.973[22, 31]

| | |
|---|---|
| 0.8496 | 179.6°[23] |
| 0.851 | 170°[22] |
| 0.8718 | 150.0°[23] |
| 0.892 | 120°[22] |
| 0.9072 | 100°[18] |

| | | | |
|---|---|---|---|
| 0.9210 | 84.0° [23] | $n_D^{20}$ | |
| 0.924 | 80° [22] | 1.5397 [77] | |
| 0.9257 | 78.45° [23] | 1.5402 [34, 40, 83] | |
| 0.9272 | 75° [23] | 1.54161 [38] | |
| 0.9396 | 60° [23] | 1.5427 [76] | |
| 0.943 | 50° [15] | 1.54282 [82] | |
| 0.9464 | 50° [23] | 1.5429 [65] | |
| 0.9469 | 50° [18] | 1.5430 [47] | |
| 0.949 | 50° [22] | 1.5434 [71] | |
| 0.9567 | 36.7° [23] | 1.5437 [67] | |
| 0.9638 | 27° [27] | 1.5438 [18] | |
| 0.9652 | 25° [23] | 1.5439 [19] | |
| 0.9659 | 25° [5] | 1.5441 [77] | |
| 0.9665 | 25° [38] | 1.5442 [71] | |
| 0.9666 | 25° [41] | 1.54493 [16] | |
| 0.9675 | 25° [28, 30] | 1.546 [31] | |
| 0.9678 | 25° [28] | 1.54638 [16] | |
| 0.9658 | 24.7° [23] | 1.54678 [16] | |
| 0.965 | 21.5° [15] | 1.487 | 170° [22] |
| 0.9694 | 21.4° [70] | 1.507 | 120° [22] |
| 0.9729 | 20.2° [31] | 1.524 | 80° [22] |
| 0.9735 | $D_{20}^{20}$ [24] | 1.537 | 50° [22] |
| 0.975 | $D_{20}^{20}$ [36] | 1.5392 | 25° [28] |
| 0.9732 | 18.0° [70] | 1.53952 | 25° [38] |
| 0.9734 | 17.8° [70] | 1.5396 | 25° [28] |
| 0.9738 | 17.6° [70] | 1.5408 | 25° [30] |
| 0.9718 | 17° [74] | 1.5410 | 25° [41] |
| 0.9737 | 17° [8] | 1.54222 | 21.4° [70] |
| 0.9731 | 15.1° [23] | 1.54605 | 20.6° [31] |
| 0.9698 | 15° [15] | 1.54614 | 20.2° [31] |
| 0.972 | 15° [57] | 1.5443 | 19.9° [24] |
| 0.974 | 15° [78] | 1.54511 | 17.8° [70] |
| 0.975 | 15° [43, 58, 59, 69] | 1.54529 | 17.6° [70] |
| 0.977 | 15° [53] | 1.5468 | 17° [8] |
| 0.9774 | 15° [68] | 1.5465 | 15° [18] |
| 0.9743 | 13.5° [23] | 1.5481 | 15° [68] |
| 0.97572 | 13.35° [49] | 1.55200 | 13.35° [49] |
| 0.9745 | 13.3° [23] | 1.55312 | 11.9° [49] |
| 0.97634 | 11.9° [49] | | |
| 0.9842 | 2° [23] | 1.51140 | $n_{H\alpha}^{78.1}$ [17] |
| 0.9825 | 0° [56] | 1.53496 | $n_{H\alpha}^{25}$ [38] |
| 0.984 | 0° [34] | 1.53765 | $n_{H\alpha}^{21.4}$ [70] |
| 0.9866 | 0° [18] | 1.54612 | $n_{H\alpha}^{20.6}$ [31] |
| 0.984 | $D_0^0$ [83] | 1.54181 | $n_{H\alpha}^{20.2}$ [31] |

| | | |
|---|---|---|
| 1.53703 | $n_{H\alpha}^{20}$ | 38 |
| 1.54021 | $n_{H\alpha}^{17.8}$ | 70 |
| 1.54057 | $n_{H\alpha}^{17.6}$ | 70 |
| 1.54703 | $n_{H\alpha}^{13.35}$ | 49 |
| 1.54819 | $n_{H\alpha}^{11.9}$ | 49 |
| 1.52700 | $n_{H\beta}^{78.1}$ | 17 |
| 1.55097 | $n_{H\beta}^{25}$ | 38 |
| 1.55405 | $n_{H\beta}^{21.4}$ | 70 |
| 1.55853 | $n_{H\beta}^{20.6}$ | 31 |
| 1.55869 | $n_{H\beta}^{20.2}$ | 31 |
| 1.55326 | $n_{H\beta}^{20}$ | 38 |
| 1.55709 | $n_{H\beta}^{17.8}$ | 70 |
| 1.55734 | $n_{H\beta}^{17.6}$ | 70 |
| 1.56533 | $n_{H\beta}^{13.35}$ | 49 |
| 1.56656 | $n_{H\beta}^{11.9}$ | 49 |
| 1.53685 | $n_{H\gamma}^{78.1}$ | 17 |
| 1.56424 | $n_{H\gamma}^{21.4}$ | 70 |
| 1.56907 | $n_{H\gamma}^{20.6}$ | 31 |
| 1.56914 | $n_{H\gamma}^{20.2}$ | 31 |
| 1.56765 | $n_{H\gamma}^{17.8}$ | 70 |
| 1.56782 | $n_{H\gamma}^{17.6}$ | 70 |
| 1.57838 | $n_{H\gamma}^{11.9}$ | 49 |

Additional Data

$$\frac{dD}{dt} = -0.0007761$$

(0 to 50°C)

(a) This constant was given as a freezing point in the literature.

(b) The boiling point 205–207 is found in references 1, 29, 43, 50, 58, 59, 66, 68, 69, 76, 80.

(c) The boiling point 205 is found in references 11, 20, 39, 40, 42, 53, 56, 72.

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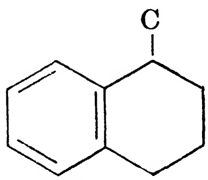
## $C_{11}H_{14}$

### 1-Methyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 218–219[44] | |
| 153–155 | 55[1] |

$D_4^{20}$

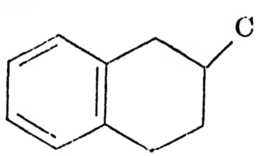
| | |
|---|---|
| 0.9536 | 25° [44] |
| 0.9546 | 25° [44] |
| 0.9547 | 25° [44] |

$n_D^{20}$

| | |
|---|---|
| 1.53316 | $n_{He}^{25}$ [44] |
| 1.53332 | $n_{He}^{25}$ [44] |
| 1.53366 | $n_{He}^{25}$ [44] |

---

### 2-Methyl-1,2,3,4-tetrahydronaphthalene

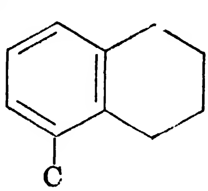


B. P., °C @ 760mm

| | |
|---|---|
| 220–222[47] | |
| 221[3] | |
| 220[33] | |
| 218–220[32] | |
| 99–101 | 13[3] |

---

### 5-Methyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

−23.02 (a)[34]

B. P., °C @ 760mm

| | |
|---|---|
| 234.4[45] | |
| 234.35[34] | |
| 184.98 | 217.2[34] |
| 143.76 | 57.3[34] |

$D_4^{20}$

| | |
|---|---|
| 0.9720[34] | |
| 0.9682 | 25° [34] |

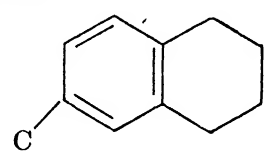
$n_D^{20}$

| | |
|---|---|
| 1.54395[34] | |
| 1.54190 | 25° [34] |
| 1.53738 | $n_{H\alpha}^{25}$ [34] |
| 1.53937 | $n_{H\alpha}^{20}$ [34] |
| 1.55325 | $n_{H\beta}^{25}$ [34] |
| 1.55536 | $n_{H\beta}^{20}$ [34] |

(a) This constant was given as a freezing point in the literature

---

### 6-Methyl-1,2,3,4-tetrahydronaphthalene



M. P., °C

−39.92 (a)[34]

B. P., °C @ 760mm

| | |
|---|---|
| 229.03[34] | |
| 229.0[45] | |
| 224–226[27] | |
| 179.91 | 217.2[34] |
| 138.75 | 57.3[34] |

$D_4^{20}$

| | |
|---|---|
| 0.950[27] | |
| 0.9537[34] | |
| 0.9500 | 25° [34] |
| 0.9541 | 15.1° [27] |

$n_D^{20}$

1.5328 [21]

| | |
|---|---|
| 1.535[27] | |
| 1.53572[34] | |
| 1.53365 | 25° [34] |
| 1.53719 | 15.1° [27] |
| 1.52920 | $n^{25}_{H\alpha}$ [34] |
| 1.53115 | $n^{20}_{H\alpha}$ [34] |
| 1.53316 | $n^{15.1}_{H\alpha}$ [27] |
| 1.54498 | $n^{25}_{H\beta}$ [34] |
| 1.54706 | $n^{20}_{H\beta}$ [34] |
| 1.54907 | $n^{15.1}_{H\beta}$ [27] |
| 1.55897 | $n^{15.1}_{H\gamma}$ [27] |

(a) This constant was given as a freezing point in the literature.

---

**x-Methyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 115–117 | 15[2] |

$D^{20}_4$

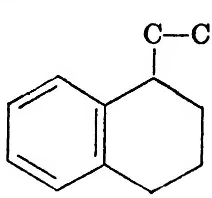
0.9368[43]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{12}H_{16}$

**1-Ethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 237–238[44] | |
| 241.5–243.5 | 739[39] |

$D^{20}_4$

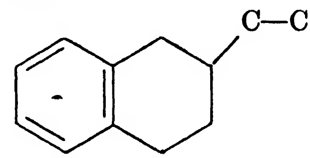
| | |
|---|---|
| 0.9529[39] | |
| 0.9498 | 25° [44] |
| 0.9511 | 25° [44] |

$n^{20}_D$

| | |
|---|---|
| 1.5388[39] | |
| 1.52992 | $n^{25}_{He}$ [44] |
| 1.52999 | $n^{25}_{He}$ [44] |

---

**2-Ethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 237[31] | |
| 235–235.5 | 731[30] |
| 63–65 | 0.5[38] |

$D^{20}_4$

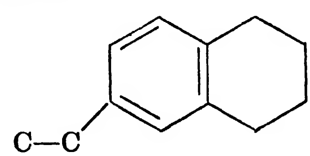
| | |
|---|---|
| 0.9401 | 15.5° [30] |
| 0.9447 | 15° [31] |
| 0.9515 | $D^0_0$ [30] |
| 0.9542 | $D^0_0$ [31] |

$n^{20}_D$

| | |
|---|---|
| 1.5250 | 15.5° [30] |
| 1.5287 | 15° [31] |

---

**6-Ethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 245–246[27] | |
| 239–239.5 | 736[30] |
| 127 | 21[22] |

$D^{20}_4$

| | |
|---|---|
| 0.948[27] | |
| 0.9499 | 17.6° [27] |
| 0.9608 | 15.5° [30] |
| 0.9733 | $D^0_0$ [30] |

$n^{20}_D$

| | |
|---|---|
| 1.534[27] | |
| 1.53474 | 17.6° [27] |

| | |
|---|---|
| 1.5350 | 15.5° [30] |
| 1.53072 | $n_{H\alpha}^{17.6}$ [27] |
| 1.54627 | $n_{H\beta}^{17.6}$ [27] |
| 1.55594 | $n_{H\gamma}^{17.6}$ [27] |

**x-Ethyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 244[5] | |
| 119–120 | 12[5] |
| 121–122 | 10[3] |

$D_4^{20}$

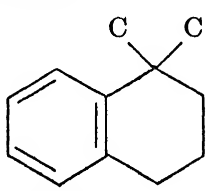
| | |
|---|---|
| 0.9632 | 17° [5] |

$n_D^{20}$

| | |
|---|---|
| 1.5414 | 16° [5] |

(a) The ethyl group may be in either the 2- or 6-position.

**1,1-Dimethyl-1,2,3,4-tetrahydronaphthalene**



B. P.,°C @ 760mm

| | |
|---|---|
| 220–222 | 761 [8] |
| 98 | 10 [8] |

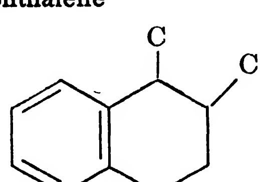
$D_4^{20}$

| | |
|---|---|
| 0.9474 | 25° [8] |

$n_D^{20}$

| | |
|---|---|
| 1.52736 | 25° [8] |

**1,2-Dimethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 235[44] | |
| 123.5–124.5 | 11[50] |

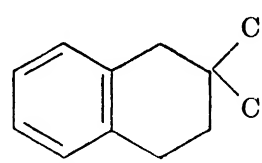
$D_4^{20}$

| | |
|---|---|
| 0.988[50] | |
| 0.9433 | 25° [44] |
| 0.9841 | 23.8° [50] |
| 0.9847 | 23.5° [50] |

$n_D^{20}$

| | |
|---|---|
| 1.5593[50] | |
| 1.55762 | 23.8° [50] |
| 1.55298 | $n_{H\alpha}^{23.8}$ [50] |
| 1.57082 | $n_{H\beta}^{23.8}$ [50] |
| 1.58195 | $n_{H\gamma}^{23.8}$ [50] |
| 1.52652 | $n_{He}^{25}$ [44] |

**2,2-Dimethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 123 | 34[48] |
| 104 | 12[15] |

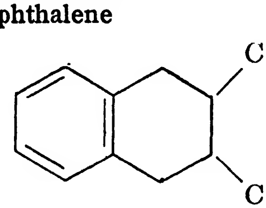
$D_4^{20}$

| | |
|---|---|
| 0.92483 | 24.1° [48] |

$n_D^{20}$

| | |
|---|---|
| 1.51850 | 24.1° [48] |

**2,3-Dimethyl-1,2,3,4-tetrahydronaphthalene**



M. P., °C

4–8 (a)[17]

−8–−5 (a)[17]

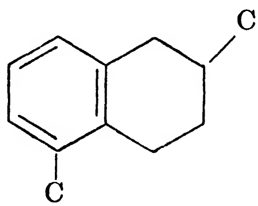
B. P., °C @ 760mm

229–231 (a)[17]
227[32, 33]
222–224 (a)[17]

(a) These constants were determined on isomeric forms.

---

**2,5-Dimethyl-1,2,3,4-tetrahydro-naphthalene**



B. P., °C @ 760mm

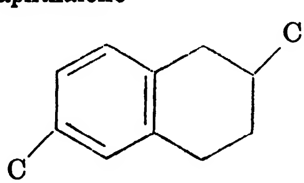
| | |
|---|---|
| 115 | 14[26] |
| 110–111 | 10[35] |

$D_4^{20}$

| | |
|---|---|
| 0.9487 | 16° [35] |

---

**2,6-Dimethyl-1,2,3,4-tetrahydro-naphthalene**



M. P., °C

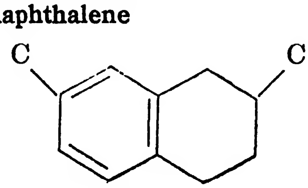
14–17[16]

B. P., °C @ 760mm

237–239[16]

---

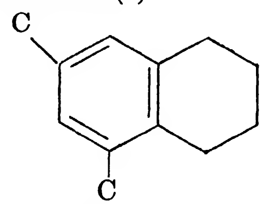
**2,7-Dimethyl-1,2,3,4-tetrahydro-naphthalene**



B. P., °C @ 760mm

237–238[16]

**5,7-Dimethyl-1,2,3,4-tetrahydro-naphthalene (a)**



B. P., °C @ 760mm

250–252[27]

$D_4^{20}$

| | |
|---|---|
| 0.960[27] | |
| 0.9589 | 21.0° [27] |

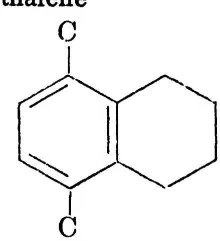
$n_D^{20}$

| | |
|---|---|
| 1.541[27] | |
| 1.54094 | 21.0° [27] |
| 1.53683 | $n_{H\alpha}^{21.0}$ [27] |
| 1.55287 | $n_{H\beta}^{21.0}$ [27] |
| 1.56297 | $n_{H\gamma}^{21.0}$ [27] |

(a) The structure of this compound was not clearly defined in the literature.

---

**5,8-Dimethyl-1,2,3,4-tetrahydro-naphthalene**

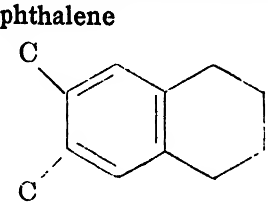


B. P., °C @ 760mm

| | |
|---|---|
| 254[4] | |
| 120 | 1[4] |

---

**6,7-Dimethyl-1,2,3,4-tetrahydro-naphthalene**

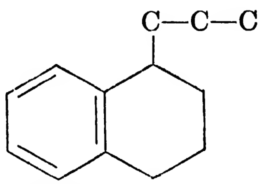


M. P., °C
10[17]

B. P., °C @ 760mm
244–246[17]
128 7[4]

## $C_{13}H_{18}$

**1-*n*-Propyl-1,2,3,4-tetrahydronaphthalene**

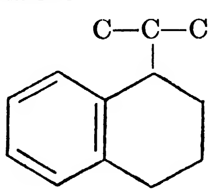


B. P., °C @ 760mm
253[44]
256–258 759[39]

$D_4^{20}$
0 9395[39]
0.9415 25° [44]

$n_D^{20}$
1.5308[39]
1.52496 $n_{He}^{25}$ [44]

**1-Isopropyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm
247[44]

$D_4^{20}$
0.9450 25° [44]

$n_D^{20}$
1.52705 $n_{He}^{25}$ [44]

**x-Isopropyl-1,2,3,4-tetrahydronaphthalene (a)**

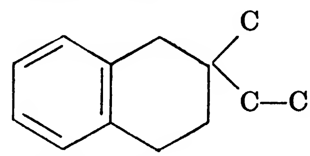
B. P., °C @ 760mm
124–126 13[3]
127 7[5]

$D_4^{20}$
0.9518 16° [5]

$n_D^{20}$
1.5352 16° [5]

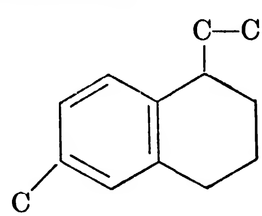
(a) The isopropyl group may be in either the 2- or 6-position.

**2-Methyl-2-ethyl-1,2,3,4-tetrahydronaphthalene**



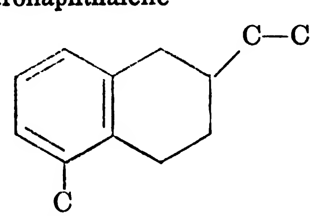
B. P., °C @ 760mm
118 20[15]

**1-Ethyl-6-methyl-1,2,3,4-tetrahydronaphthalene**



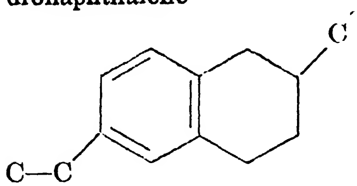
B. P., °C @ 760mm
126 10[11]

**2-Ethyl-5-methyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm
130 16[23]

**2-Methyl-6-ethyl-1,2,3,4-tetrahydronaphthalene**

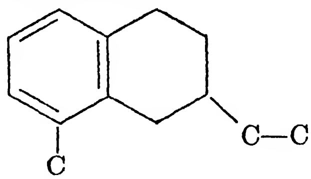


B. P., °C @ 760mm

| | |
|---|---|
| 140–145 | 10[12] |

---

**3-Ethyl-5-methyl-1,2,3,4-tetrahydronaphthalene**

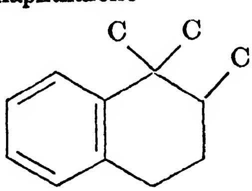


B. P., °C @ 760mm

| | |
|---|---|
| 129–131 | 14[23] |

---

**1,1,2-Trimethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

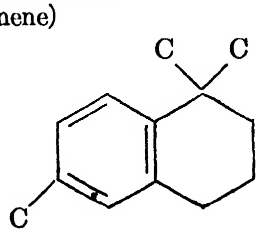
| | |
|---|---|
| 241–242 | 760.7[42] |

$n_D^{20}$

| | |
|---|---|
| 1.5270 | 25°[42] |

---

**1,1,6-Trimethyl-1,2,3,4-tetrahydronaphthalene**
(Ionene)



B. P., °C @ 760mm

| | |
|---|---|
| 240–242 | 752[9] |
| 238–239 | 730[37] |
| 130 | 30[14] |
| 114 | 14[9] |
| 107 | 10[9] |
| 88–91 | 4[8] |

$D_4^{20}$

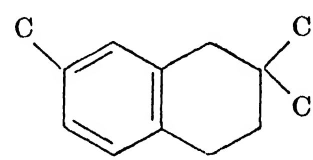
| | |
|---|---|
| 0.9303[9] | |
| 0.9331[9] | |
| 0.9356[37] | |
| 0.9320 | 25°[8] |

$n_D^{20}$

| | |
|---|---|
| 1.5225[9] | |
| 1.5257[37] | |
| 1.52167 | 25°[8] |

---

**2,2,7-Trimethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 128 | 23[48] |

$D_4^{20}$

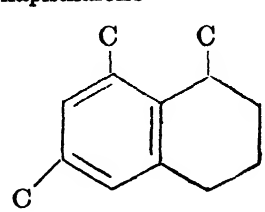
| | |
|---|---|
| 0.91747 | 24.5°[48] |

$n_D^{20}$

| | |
|---|---|
| 1.51635 | 24.5°[48] |

---

**1,6,8-Trimethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 133–136 | 18.5[24] |

## $C_{14}H_{20}$

**x-*n*-Butyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 272–273 | 750[39] |
| 269–270 | 750[39] |

$D_4^{20}$

0.9312[39]
0.9331[39]

$n_D^{20}$

1.5258[39]
1.5271[39]

(a) The structure of this compound was not clearly defined in the literature.

---

**x-*sec*-Butyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 268–270 | 759[39] |

$D_4^{20}$

0.9356[39]

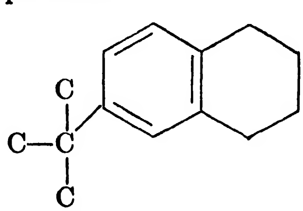
$n_D^{20}$

1.5255[39]

(a) The structure of this compound was not clearly defined in the literature.

---

**6-*tert*-Butyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 262–264 | 752[10] |
| 138–140 | 18[10] |
| 135–136 | 16[10] |

**x-*tert*-Butyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 265–267 | 746[39] |
| 129 | 11[3] |

$D_4^{20}$

0.9349[39]

$n_D^{20}$

1.5292[39]

(a) The structure of this compound was not clearly defined in the literature.

---

**x-Butyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 265 5–266.5[5] | |
| 138 | 9[5] |

$D_4^{20}$

| | |
|---|---|
| 0.9463 | 15° [5] |

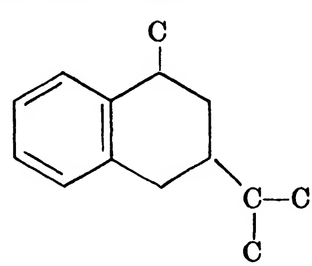
$n_D^{20}$

| | |
|---|---|
| 1.5348 | 15° [5] |

(a) The butyl group may be in either the 2- or 6-position.

---

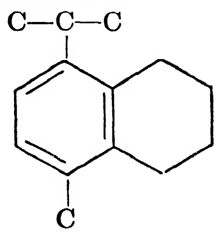
**1-Methyl-3-isopropyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 138–139 | 16[18] |

**5-Methyl-8-isopropyl-1,2,3,4-tetrahydronaphthalene**

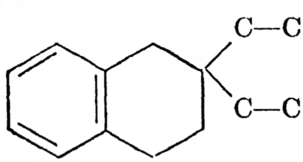


B. P., °C @ 760mm

| | |
|---|---|
| 135–140 | 12[46] |

---

**2,2-Diethyl-1,2,3,4-tetrahydronaphthalene**

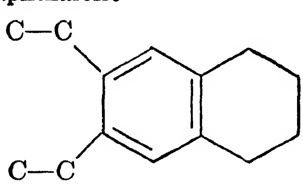


B. P., °C @ 760mm

| | |
|---|---|
| 110 | 4[48] |

---

**6,7-Diethyl-1,2,3,4-tetrahydronaphthalene**

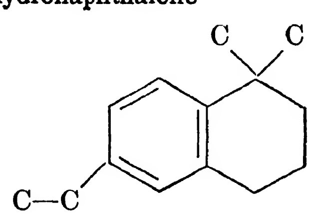


B. P., °C @ 760mm

| | |
|---|---|
| 150–151 | 18[22] |

---

**1,1-Dimethyl-6-ethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 104–105 | 4[41] |

$D_4^{20}$

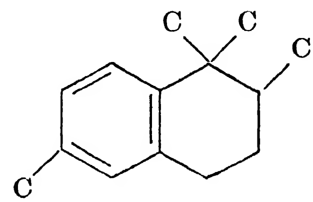
| | |
|---|---|
| 0.9304 | 25°[41] |

$n_D^{20}$

| | |
|---|---|
| 1.5220 | 25°[41] |

---

**1,1,2,6-Tetramethyl-1,2,3,4-tetrahydronaphthalene**
(Irene)



B. P., °C @ 760mm

| | |
|---|---|
| 120–125 | 10[6,7] |

$D_4^{20}$

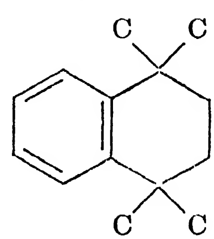
| | |
|---|---|
| 0.9379 | 25°[6] |

$n_D^{20}$

| | |
|---|---|
| 1.511[7] | |
| 1.5261 | 25°[6] |

---

**1,1,4,4-Tetramethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 248[13] | |
| 82–84 | 3[13] |

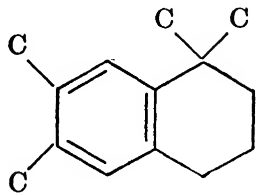
$D_4^{20}$

| | |
|---|---|
| 0.9482 | 27°[13] |

$n_D^{20}$

| | |
|---|---|
| 1.5278 | 27°[13] |

**1,1,6,7-Tetramethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm
103–104 4[41]

$D_4^{20}$
0.9392 25° [41]

$n_D^{20}$
1.5280 25° [41]

---

$C_{15}H_{22}$

**x-Pentyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm
147–150 12[5]

$D_4^{20}$
0.9478 17° [5]

$n_D^{20}$
1.5332 17° [5]

(a) The pentyl group may be in either the 2- or 6-position.

---

$C_{16}H_{24}$

**x-Hexyl-1,2,3,4-tetrahydronaphthalene** (a)

B. P., °C @ 760mm
120.5–122 0.8[40]

$D_4^{20}$
0.9203[40]

$n_D^{20}$
1.5171[40]

(a) The structure of this compound was not clearly defined in the literature.

$C_{18}H_{28}$

**x-*n*-Octyl-1,2,3,4-tetrahydronaphthalene** (a)

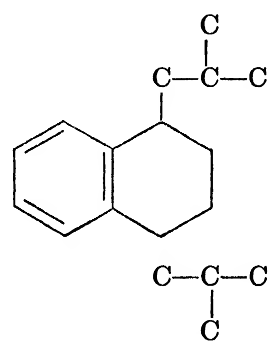
B. P., °C @ 760mm
324–326 740[39]

$D_4^{20}$ 0.9132[39]
$n_D^{20}$ 1.5138[39]

(a) The structure of this compound was not clearly defined in the literature.

---

**1,4-Diisobutyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm
170–175 16[25]

| | | |
|---|---|---|
| $D_4^{20}$ | 0.8619 | 100° [19] |
| | 0.8939 | 50° [19] |
| | 0.9137 | 19° [25, 29] |
| | 0.9194 | 10° [25] |
| | 0.9259 | 0° [19] |
| $n_D^{20}$ | 1.5184 | 18° [25, 29] |

---

$C_{22}H_{36}$

**x,x-Dihexyl-1,2,3,4-tetrahydronaphthalene** (a)

M. P., °C
−36[40]

B. P., °C @ 760mm
182–184 1.5[40]

$D_4^{20}$

0.9303[40]

0.9358 $D_{15}^{15}$ [40]

$n_D^{20}$

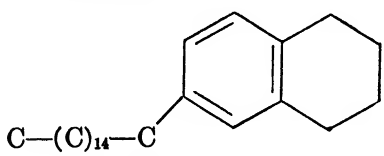
1.5220[40]

(a) The structure of this compound was not clearly defined in the literature.

---

### $C_{26}H_{44}$

**6-*n*-Hexadecyl-1,2,3,4-tetrahydronaphthalene**



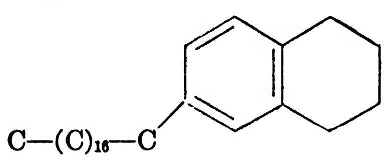
B. P., °C @ 760mm

210–215 1[20]

---

### $C_{28}H_{48}$

**6-*n*-Octadecyl-1,2,3,4-tetrahydronaphthalene**



M. P., °C

32.5–33[28]

29–30[36]

$D_4^{20}$

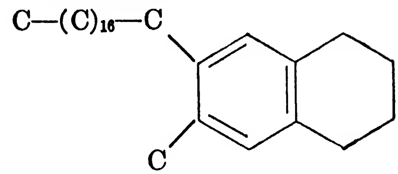
| | |
|---|---|
| 0.8656 | 55° [28] |
| 0.8722 | 45° [28] |

$n_D^{20}$

| | |
|---|---|
| 1.48656 | 55° [28] |
| 1.48280 | $n_{H\alpha}^{55}$ [28] |
| 1.49371 | $n_{H\beta}^{55}$ [28] |

### $C_{29}H_{50}$

**6-Methyl-7-*n*-octadecyl-1,2,3,4-tetrahydronaphthalene**



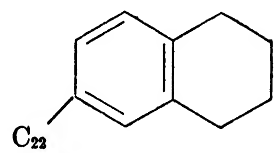
M. P., °C

60–61[20]

---

### $C_{32}H_{56}$

**6-Docosyl-1,2,3,4-tetrahydronaphthalene**



M. P., °C

43–45[36]

$D_4^{20}$

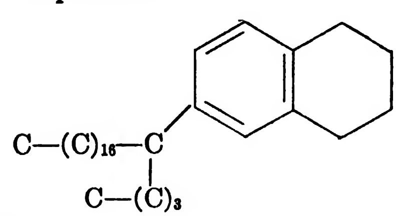
0.8786 25° [36]

$n_D^{20}$

1.4969 25° [36]

---

**6-(5′-Docosyl)-1,2,3,4-tetrahydronaphthalene**



$D_4^{20}$

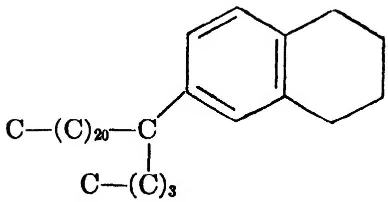
0.881 25° [36]

$n_D^{20}$

| | |
|---|---|
| 1.4723 | 80° [49] |
| 1.4932 | 25° [36, 49] |

## $C_{36}H_{64}$

### 6-(5′-Hexacosyl)-1,2,3,4-tetrahydronaphthalene



M. P., °C

35[36]

$D_4^{20}$

| | |
|---|---|
| 0.8762 | 25° [36] |

$n_D^{20}$

| | |
|---|---|
| 1.4940 | 25° [36] |

*References on $C_{11}H_{14}$ through $C_{36}H_{64}$ Compounds*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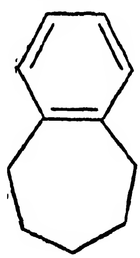
## 3. HIGHER BENZOCYCLANES, $C_nH_{2n-8}$

### $C_{11}H_{14}$

**Benzocycloheptane**
(Benzosuberane)



B. P., °C @ 760mm

| | |
|---|---|
| 217 | 764[1,4] |

$D_4^{20}$

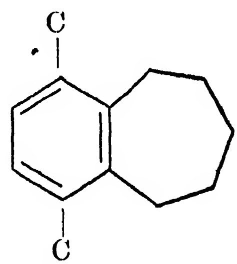
| | |
|---|---|
| 0.9693 | 19° [4] |
| 0.9683 | 16.2° [2] |

$n_D^{20}$

| | |
|---|---|
| 1.5458 | 19° [4] |
| 1.54364 | $n_{H\alpha}^{16.2}$ [2] |
| 1.56040 | $n_{H\beta}^{16.2}$ [2] |
| 1.57108 | $n_{H\gamma}^{16.2}$ [2] |
| 1.54856 | $n_{He}^{16.2}$ [2] |

### $C_{13}H_{18}$

**2,3-Cycloheptano-1,4-dimethylbenzene**



B. P., °C @ 760mm

| | |
|---|---|
| 122 | 13[3] |

$D_4^{20}$

| | |
|---|---|
| 0.9621 | 20.5° [3] |

$n_D^{20}$

| | |
|---|---|
| 1.5344 | 20.5° [3] |

*References on Higher Benzocyclanes*

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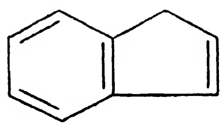
## II. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-10}$

1. Indene and Its Alkyl Derivatives
2. Indane with One Alkenyl or One Alkylidene Substitution
3. Dihydronaphthalene and Its Alkyl Derivatives
4. Tetrahydronaphthalene Derivatives of Empirical Formula $C_nH_{2n-10}$
5. Cyclopentanotetrahydronaphthalenes and Their Alkyl Derivatives
6. Octahydroanthracenes and Their Alkyl Derivatives
7. Octahydrophenanthrenes and Their Alkyl Derivatives
8. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-10}$

## 1. INDENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-10}$

### $C_9H_8$

**Indene**



M. P., °C

- −1.50 (a)[38]
- −1.67[8]
- −1.76[14]
- −2[39,40]

B. P., °C @ 760mm

- **181**
- 181–183[1,11]
- 182.4[20]
- 181.8–182.3[9]
- 182.2[36]
- 182[23,50]
- 181–182[58]
- 181–181.5[52]
- 181.0[29]
- 181 (b)
- 179.5–180.5[29,30]
- 179.0–180.4[26]
- 180.0[29]
- 179.5–180[56]
- 179.5[28]
- 178.5–179.5[30]
- 179[27,40]

| | |
|---|---|
| 180.5–181 | 764[30] |
| 182.2–182.4 | 761[39] |
| 179.5–180.5 | 757[17] |
| 182.1–182.7 | 756.4[6] |
| 181–181.3 | 749.6[13] |
| 83.8 | 30.5[8] |
| 76 | 25[31] |
| 68 | 15[44] |
| 70.8 | 12[16] |
| 62 | 10[25] |
| 55.0–55.5 | 6.5[12] |
| 35–37 | 2[51] |

$D_4^{20}$

| | |
|---|---|
| 0.9915[40] | |
| 0.992[44] | |
| 0.9968[9] | |
| 1.000[1] | |
| 0.9232 | 100°[9] |
| 0.9692 | 50°[9] |
| 0.984 | 25°[6] |
| 0.9906 | $D_{25}^{25}$[29,30] |
| 1.0121 | $D_{25}^{25}$[29] |
| 0.9925 | $D_{20}^{20}$[29] |
| 0.9934 | $D_{20}^{20}$[30] |
| 1.006 | $D_{20}^{20}$[21] |
| 1.0152 | $D_{20}^{20}$[29,30] |
| 0.9975 | 18°[40] |
| 1.008 | 15°[50] |
| 1.040 | 15°[17] |
| 0.9970 | $D_{15}^{15}$[30] |
| 0.9971 | $D_{15}^{15}$[29] |
| 1.0002 | $D_{15}^{15}$[39] |
| 1.0187 | $D_{15}^{15}$[29,30] |
| 1.01995 | 12.7°[29] |
| 1.0001 | 12°[12] |
| 1.0008 | $D_{10}^{10}$[29,30] |
| 1.0225 | $D_{10}^{10}$[29,30] |
| 1.00227 | 8.2°[29] |
| 1.0060 | 8°[40] |
| 1.0050 | $D_5^5$[29] |
| 1.0268 | $D_5^5$[29] |
| 1.0059 | 4°[29,30] |
| 1.0081 | 4°[13] |
| 1.0277 | 4°[29,30] |
| 1.0152 | 0°[9] |

$n_D^{20}$

- 1.5642[1]

| | |
|---|---|
| 1.575[44] | |
| 1.5764[38] | |
| 1.5768[9] | |
| 1.5755 | 25° [25] |
| 1.5743 | 22° [57] |
| 1.5769 | 22° [58] |
| 1.5767 | 19.8° [8] |
| 1.5770 | 19° [19] |
| 1.5773 | 18.5° [39] |
| 1.5763 | 17.6° [16] |
| $1.5738_7$ | 16.1° [7] |
| 1.57980 | 15.3° [30] |
| 1.5790 | 15° [9] |
| 1.5804 | 10° [12] |
| 1.57980 | 8.2° [29] |
| 1.56940 | $n_{H\alpha}^{20}$ [40] |
| $1.5675_4$ | $n_{H\alpha}^{16.1}$ [7] |
| 1.56454 | $n_{H\alpha}^{15.6}$ [30] |
| 1.57354 | $n_{H\alpha}^{15.3}$ [30] |
| 1.56454 | $n_{H\alpha}^{12.7}$ [29] |
| 1.57354 | $n_{H\alpha}^{8.2}$ [29] |
| $1.5903_9$ | $n_{H\beta}^{16.1}$ [7] |
| 1.58743 | $n_{H\beta}^{15.6}$ [30] |
| 1.59693 | $n_{H\beta}^{15.3}$ [30] |
| 1.58743 | $n_{H\beta}^{12.7}$ [29] |
| 1.59693 | $n_{H\beta}^{8.2}$ [29] |
| 1.60220 | $n_{H\gamma}^{15.6}$ [30] |
| 1.61219 | $n_{H\gamma}^{15.3}$ [30] |
| 1.60220 | $n_{H\gamma}^{12.7}$ [29] |
| 1.61219 | $n_{H\gamma}^{8.2}$ [29] |

(c)

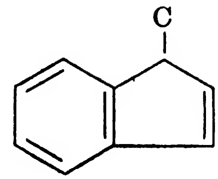
(a) This constant was given as a freezing point in the literature.

(b) The boiling point 181 is found in references 5, 10, 14, 19, 22, 29, 30, 57.

(c) Refractive indices at other lines are found in references 29, 30.

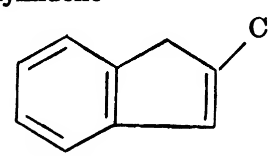
## $C_{10}H_{10}$

### 1-Methylindene



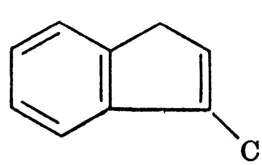
| | | |
|---|---|---|
| B. P., °C @ 760mm | | |
| | 198–202[43] | |
| | 197–200[24] | |
| | 198.5[54] | |
| | 70 | 10[35] |
| $D_4^{20}$ | 0.9640[54] | |
| | 0.9708 | 25° [35] |
| $n_D^{20}$ | 1.5595 | 25° [35] |

### 2-Methylindene



| | | |
|---|---|---|
| B. P., °C @ 760mm | | |
| | 184–185 | 741[47] |
| | 97–99 | 24[15] |
| | 96–97 | 24[15] |
| | 94–96 | 24[15] |
| | 62–65 | 20[47] |
| | 79 | 10[35] |
| $D_4^{20}$ | 0.9734 | 19° [35] |
| | 0.9897 | 14° [47] |
| $n_D^{20}$ | 1.5645 | 23° [15] |
| | 1.5646 | 23° [15] |
| | 1.5650 | 19° [35] |
| | 1.57574 | 14° [47] |

### 3-Methylindene



B. P., °C @ 760mm

| | |
|---|---|
| 205–206[2, 3, 33, 34, 41] | |
| 91–92 | 24[15] |
| 86 | 15[44] |
| 81–83 | 14[15] |
| 77–81 | 14[15] |
| 81 | 13[32] |

$D_4^{20}$

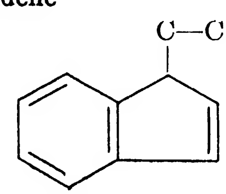
| | |
|---|---|
| 0.975[44] | |
| 0.9682 | 27° [3] |

$n_D^{20}$

| | |
|---|---|
| 1.562[44] | |
| 1.5535 | 27° [15] |
| 1.5590 | 27° [15] |
| 1.55907 | 27° [3] |
| 1.5598 | 23° [15] |
| 1.55319 | $n_{H\alpha}^{27}$ [3] |
| 1.57460 | $n_{H\beta}^{27}$ [3] |
| 1.58865 | $n_{H\gamma}^{27}$ [3] |

## $C_{11}H_{12}$

### 1-Ethylindene



B. P., °C @ 760mm

| | |
|---|---|
| 226[45] | |
| 215–216[54] | |
| 116 | 18[54] |
| 92 | 12[35] |

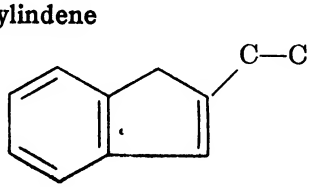
$D_4^{20}$

| | |
|---|---|
| 0.9645 | 22° [35] |
| 0.9732 | 22° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.5543 | 22° [35] |

### 2-Ethylindene



B. P., °C @ 760mm

| | |
|---|---|
| 96 | 11[35] |

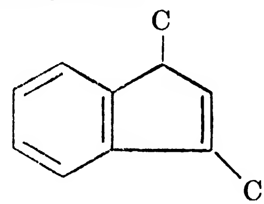
$D_4^{20}$

| | |
|---|---|
| 0.9619 | 22° [35] |

$n_D^{20}$

| | |
|---|---|
| 1.5525 | 22° [35] |

### 1,3-Dimethylindene



B. P., °C @ 760mm

| | |
|---|---|
| 212–214[46] | |
| 86–88 | 11[46] |

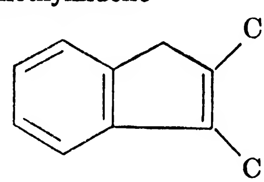
$D_4^{20}$

0.9553[46]

$n_D^{20}$

1.53444[46]

### 2,3-Dimethylindene



M. P., °C

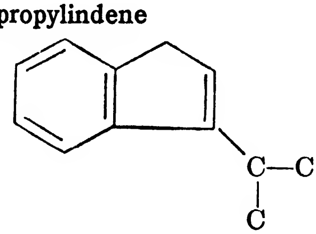
11[41]

B. P., °C @ 760mm

| | |
|---|---|
| 111.5–112.5 | 19[41] |

## $C_{12}H_{14}$

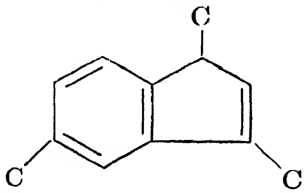
### 3-Isopropylindene



B. P., °C @ 760mm

| | |
|---|---|
| 113 | 15[42] |

**1,3,5-Trimethylindene**



B. P., °C @ 760mm

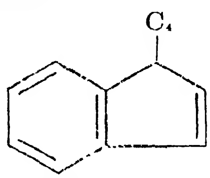
103–104  14[49]

$n_D^{20}$

1.5478[49]

## $C_{13}H_{16}$

**1-Butylindene**



B. P., °C @ 760mm

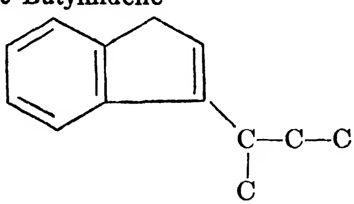
252–255[45]

120  10[45]

$D_4^{20}$

0.9552  23° [45]

**3-*sec*-Butylindene**

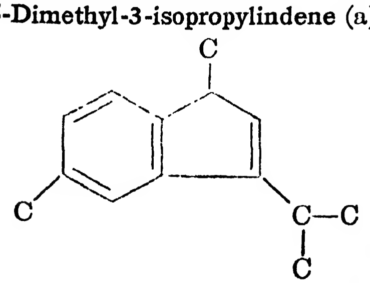


B. P., °C @ 760mm

116–118  12[55]

## $C_{14}H_{18}$

**1,5-Dimethyl-3-isopropylindene** (a)



B. P., °C @ 760mm

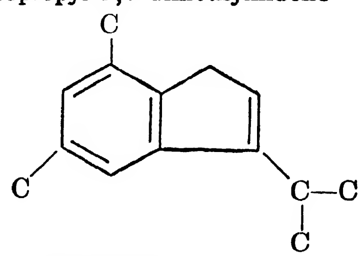
115–120  11[49]

$D_4^{20}$

1.5395  21° [49]

(a) The above formula was given for this compound, but the name given in the literature was "1-Isopropyl-3,6-dimethylindene."

**3-Isopropyl-5,7-dimethylindene**



B. P., °C @ 760mm

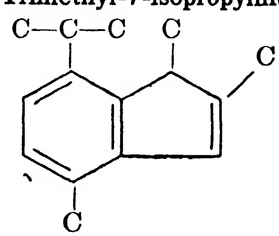
125–130  0.2[48]

$n_D^{20}$

1.5426  18.5° [48]

## $C_{15}H_{20}$

**1,2,4-Trimethyl-7-isopropylindene**



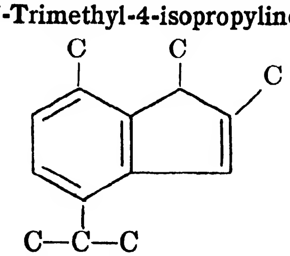
M. P., °C

99.5[53]

B. P., °C @ 760mm

140–145  10[53]

**1,2,7-Trimethyl-4-isopropylindene**



B. P., °C @ 760mm

| | |
|---|---|
| 154–157 | 17[4] |

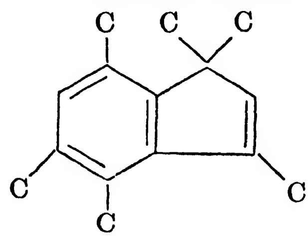
$D_4^{20}$

| | |
|---|---|
| 0.9574 | $D_{25}^{25}$ [4] |

$n_D^{20}$

| | |
|---|---|
| 1.5428 | 25° [4] |

## 1,1,3,4,5,7-Hexamethylindene



M. P., °C

87.5–88.5[37]

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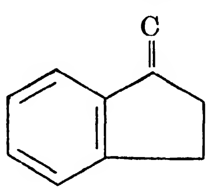
## 2. INDANE WITH ONE ALKENYL OR ONE ALKYLIDENE SUBSTITUTION, $C_nH_{2n-10}$

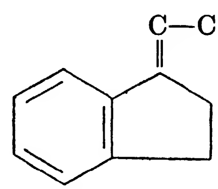
### $C_{10}H_{10}$

**1-Methyleneindane**
(Dihydrobenzofulvene)



B. P., °C @ 760mm
91–93 17[2]

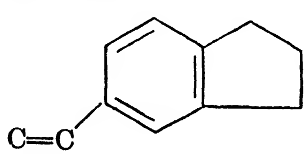
**1-Ethylideneindane**



B. P., °C @ 760mm
103–105 17[2]

### $C_{11}H_{12}$

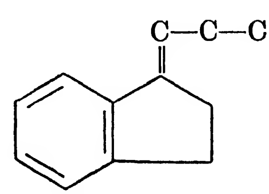
**5-Ethenylindane**



B. P., °C @ 760mm
95–100 10[1]

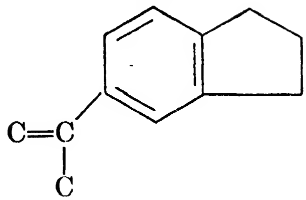
### $C_{12}H_{14}$

**1-Propylideneindane**



B. P., °C @ 760mm
113–115 17[2]

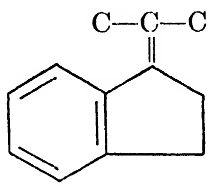
**5-Isopropenylindane**



B. P., °C @ 760mm

| | |
|---|---|
| 84 | 2[1] |

**1-Isopropylideneindane**

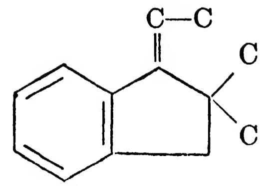


B. P., °C @ 760mm

| | |
|---|---|
| 133–135 | 17[2] |

$C_{13}H_{16}$

**1-Ethylidene-2,2-dimethylindane**

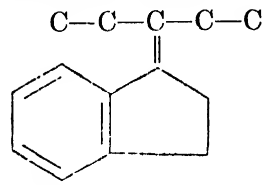


B. P., °C @ 760mm

| | |
|---|---|
| 112–114 | 13[3] |

$C_{14}H_{18}$

**1-(3′-Pentylidene)-indane**



B. P., °C @ 760mm

| | |
|---|---|
| 136–138 | 15[2] |

*References on Indane with One Alkenyl or One Alkylidene Substitution*

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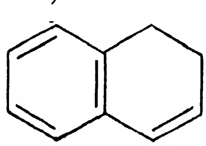
## 3. DIHYDRONAPHTHALENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-10}$

$C_{10}H_{10}$

**1,2-Dihydronaphthalene**
($\Delta^1$-Dialin)



M. P., °C

**−8**
−4[26]
−7– −5[45]
−8– −7[44]
−9– −7[45]
−8[14, 30, 53]
−9– −8[55]
−9[16, 43, 46, 55]

B. P., °C @ 760mm

| | |
|---|---|
| **211** | |
| 212[10, 25] | |
| 211–212[29] | |
| 210–212[9] | |
| 209–210[26] | |
| 206–207[17] | |
| 206.5–207 | 764[16] |
| 89–90 | 24[55] |
| 92.5 | 19[44] |
| 84 | 17[48] |

| | |
|---|---|
| 93 | 16[45] |
| 89 | 16[52] |
| 84.5 | 16[55] |
| 91 | 15[53] |
| 90 | 15[45] |
| 82–83 | 15[31] |
| 84–85 | 12[44] |
| 83–83.5 | 12[18] |
| 89 | 10[47] |
| 78 | 9[52] |
| 74.0–74.5 | 6[12] |
| 83–84 | 5[26] |

$D_4^{20}$

| | |
|---|---|
| **0.9966** | |
| 0.9974[55] | |
| 0.9904 | 27°[15] |
| 0.9926 | 25°[17] |
| 0.9931 | 25°[16] |
| 0.9963 | 21.5°[53] |
| 0.9976 | 18.3°[52] |
| 0.9982 | 18.2°[52] |
| 0.9977 | 18.15°[52] |
| 0.9983 | 18.1°[52] |
| 0.99448 | 14.7°[29] |
| 0.99688 | 12.7°[29] |
| 0.99745 | 12.4°[29] |
| 1.0031 | 10.5°[44] |

$n_D^{20}$

| | |
|---|---|
| 1.5817[18] | |
| 1.5782 | 25°[17] |
| 1.5789 | 25°[16] |
| 1.58317 | 18.3°[52] |
| 1.58326 | 18.1°[52] |
| 1.57399 | 14.7°[29] |
| 1.57549 | 12.7°[29] |
| 1.57494 | 12.4°[29] |
| 1.57637 | $n_{H\alpha}^{18.3}$ [52] |
| 1.57655 | $n_{H\alpha}^{18.1}$ [52] |
| 1.56827 | $n_{H\alpha}^{14.7}$ [29] |
| 1.56981 | $n_{H\alpha}^{12.7}$ [29] |
| 1.56910 | $n_{H\alpha}^{12.4}$ [29] |
| 1.60088 | $n_{H\beta}^{18.3}$ [52] |
| 1.60101 | $n_{H\beta}^{18.1}$ [52] |
| 1.59040 | $n_{H\beta}^{14.7}$ [29] |
| 1.59189 | $n_{H\beta}^{12.7}$ [29] |
| 1.59135 | $n_{H\beta}^{12.4}$ [29] |
| 1.61720 | $n_{H\gamma}^{18.3}$ [52] |
| 1.61738 | $n_{H\gamma}^{18.1}$ [52] |

Additional Data

$dD/dt = -0.0007473/°C$ (10 to 27°C)

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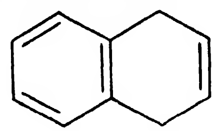
## 1,4-Dihydronaphthalene



M. P., °C

**24.5**
28[40]
25.5[26]
25[52]
24.5–25.0[47]
24.5–25[44]
24.5–24.8[43]
24.5[3, 18, 46]
24[14, 49]
23.24[19]
16[22]
15.5[1]
15[27, 28]

B. P., °C @ 760mm

| | |
|---|---|
| 212[20, 33] | |
| 208.5–209[40] | |
| 205[2] | |
| 199–201[54] | |
| 211 | 713[1] |
| 94.5 | 17[3, 44] |
| 94 | 17[48] |
| 86.5 | 12[18] |
| 84 | 9.5[52] |

$D_4^{20}$

| | |
|---|---|
| 0.9928 | 34.1°[52] |
| 0.9935 | 33.3°[52] |

| | |
|---|---|
| 0.9928 | 32.7° [52] |

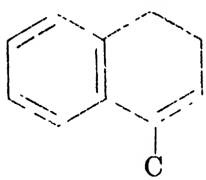
$n_D^{20}$

| | |
|---|---|
| 1.5593[18] | |
| 1.55474 | 33.3° [52] |
| 1.55489 | 32.7° [52] |
| 1.54963 | $n_{H\alpha}^{33.3}$ [52] |
| 1.54992 | $n_{H\alpha}^{32.7}$ [52] |
| 1.56730 | $n_{H\beta}^{33.3}$ [52] |
| 1.56752 | $n_{H\beta}^{32.7}$ [52] |
| 1.57861 | $n_{H\gamma}^{33.3}$ [52] |
| 1.57866 | $n_{H\gamma}^{32.7}$ [52] |

---

## $C_{11}H_{12}$

### 4-Methyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 228[7] | |
| 107–108 | 14[32] |
| 107 | 14[41] |
| 92–93 | 14[31] |
| 116–117 | 11[50, 51] |
| 84 | 5[8] |

$D_4^{20}$

0.9901[41]

$n_D^{20}$

| | |
|---|---|
| 1.5742 | 25° [8] |
| 1.5618 | 21.5° [50, 51] |

---

### 2-Methyl-x,x-dihydronaphthalene (a)

B. P., °C @ 760mm

| | |
|---|---|
| 107–108 | 14[50, 51] |

$n_D^{20}$

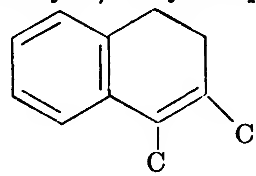
1.5522[50, 51]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{12}H_{14}$

### 3,4-Dimethyl-1,2-dihydronaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 250–251[42] | |
| 114–116 | 15[42] |

$D_4^{20}$

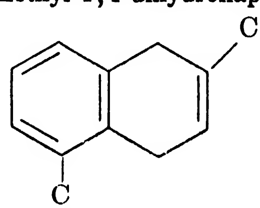
| | |
|---|---|
| 0.9885 | 17° [42] |

$n_D^{20}$

1.5763[42]

---

### 2,5-Dimethyl-1,4-dihydronaphthalene



B. P., °C @ 760mm

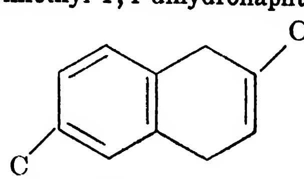
| | |
|---|---|
| 118 | 10[24] |

$D_4^{20}$

| | |
|---|---|
| 0.9700 | 16° [24] |

---

### 2,6-Dimethyl-1,4-dihydronaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 125–126 | 15[23] |

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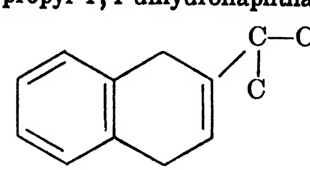
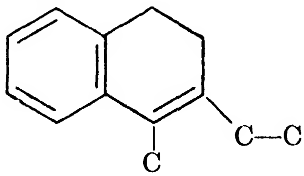
## $C_{13}H_{16}$

### 2-Isopropyl-1,4-dihydronaphthalene



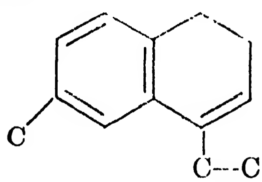
B. P., °C @ 760mm
122–127 12[35]

**3-Ethyl-4-methyl-1,2-dihydronaphthalene**



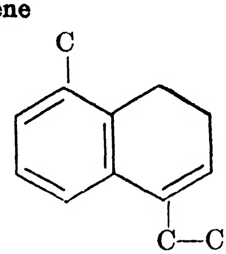
B. P., °C @ 760mm
135–145 11[5]

**4-Ethyl-6-methyl-1,2-dihydronaphthelene**



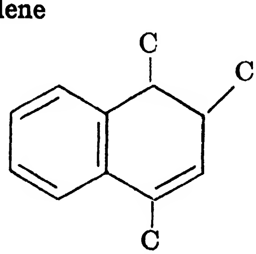
B. P., °C @ 760mm
135 16[4]

**4-Ethyl-8-methyl-1,2-dihydronaphthalene**



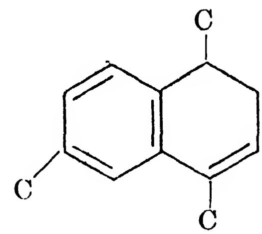
B. P., °C @ 760mm
130–131 12[11]

**1,2,4-Trimethyl-1,2-dihydronaphthalene**



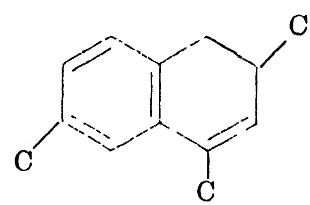
B. P., °C @ 760mm
109 11[36]

**1,4,6-Trimethyl-1,2-dihydronaphthalene**



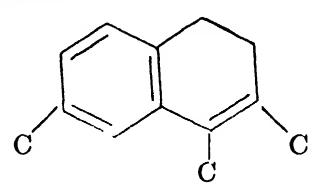
B. P., °C @ 760mm
135–138 13[36]
122–123 12[34]

**2,4,6-Trimethyl-1,2-dihydronaphthalene**



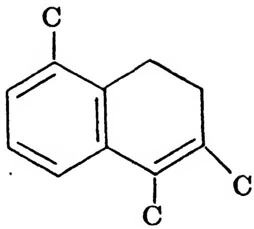
B. P., °C @ 760mm
115–117 10[36]

**3,4,6-Trimethyl-1,2-dihydronaphthalene**



B. P., °C @ 760mm
145–150[6]
130 13[36]

**3,4,8-Trimethyl-1,2-dihydronaphthalene**



B. P., °C @ 760mm

130–131 11[37]

$D_4^{20}$

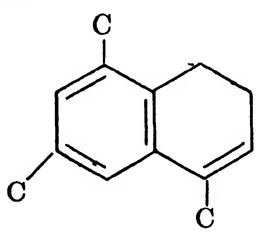
0.9760[37]

$n_D^{20}$

1.5672[37]

---

**4,6,8-Trimethyl-1,2-dihydronaphthalene**



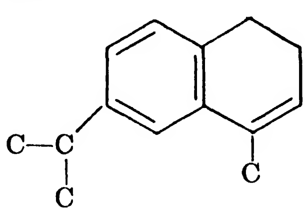
B. P., °C @ 760mm

143–145 18[13]

---

## $C_{14}H_{18}$

**4-Methyl-6-isopropyl-1,2-dihydronaphthalene**



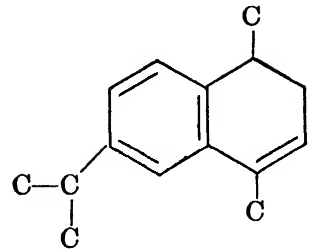
B. P., °C @ 760mm

137 12[39]

---

## $C_{15}H_{20}$

**1,4-Dimethyl-6-isopropyl-1,2-dihydronaphthalene**



B. P., °C @ 760mm

154–155 12[38]

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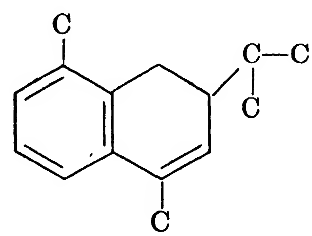
**2-Isopropyl-4,8-dimethyl-1,2-dihydronaphthalene**



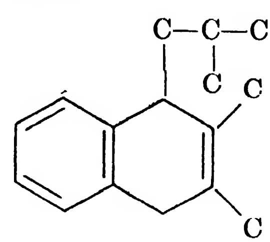
B. P., °C @ 760mm

108 0.8[38]

---

## $C_{16}H_{22}$

**1-Isobutyl-2,3-dimethyl-1,4-dihydronaphthalene**



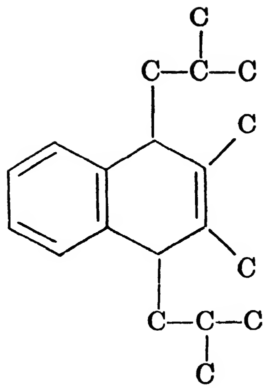
B. P., °C @ 760mm

150[21]

---

## $C_{20}H_{30}$

**1,4-Diisobutyl-2,3-dimethyl-1,4-dihydronaphthalene**



B. P., °C @ 760mm
180[21]

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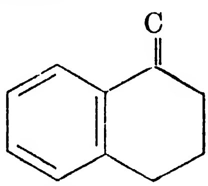
## 4. TETRAHYDRONAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-10}$

### $C_{11}H_{12}$

**1-Methylene-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

103 14[8]

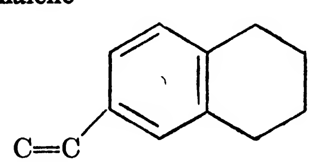
$D_4^{20}$

0.9836[8]

---

### $C_{12}H_{14}$

**6-Ethenyl-1,2,3,4-tetrahydronaphthalene**



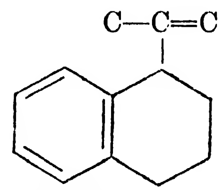
B. P., °C @ 760mm

96 2[5]

---

### $C_{13}H_{16}$

**1-Isopropenyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

259–261 745[2]

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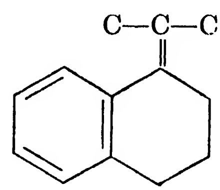
**1-Isopropylidene-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

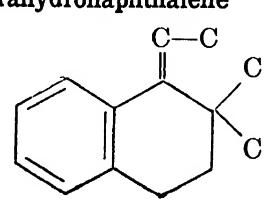
251–253 771[2]

245–247 744[2]

---

### $C_{14}H_{18}$

**1-Ethylidene-2,2-dimethyl-1,2,3,4-tetrahydronaphthalene**

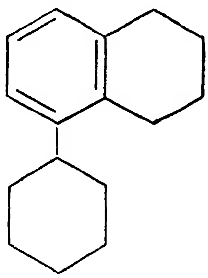


B. P., °C @ 760mm
122–123 14[7]

---

## $C_{16}H_{22}$

### 5-Cyclohexyl-1,2,3,4-tetrahydronaphthalene



B. P., °C @ 760mm
118 0.2[1]

---

### x-Cyclohexyl-1,2,3,4-tetrahydronaphthalene (a)

B. P., °C @ 760mm
147–149 3[6]

$D_4^{20}$
0.9891[6]
0.9939 $D_{15}^{15}$ [6]

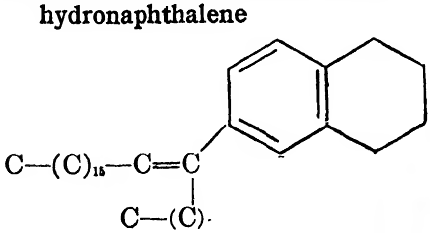
$n_D^{20}$
1.5490[6]
1.5420 40° [6]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{32}H_{54}$

### 6-(5′-Docosen-5′-yl)-1,2,3,4-tetrahydronaphthalene




B. P., °C @ 760mm
263–264 4[4]

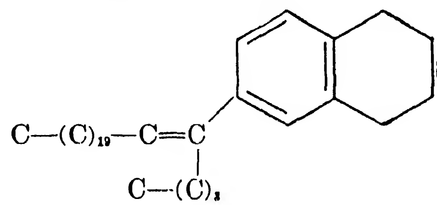
$D_4^{20}$
0.890 25° [3]

$n_D^{20}$
1.5048 25° [3]

---

## $C_{36}H_{62}$

### 6-(5′-Hexacosen-5′-yl)-1,2,3,4-tetrahydronaphthalene




$D_4^{20}$
0.8790[3]

$n_D^{20}$
1.5030[3]

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*References on Tetrahydronaphthalene Derivatives of Empirical Formula $C_nH_{2n-10}$*

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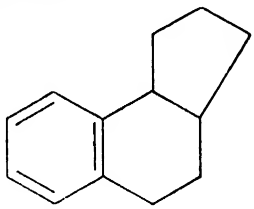
## 5. CYCLOPENTANOTETRAHYDRONAPHTHALENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-10}$

### $C_{13}H_{16}$

**1,2-Cyclopentano-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 266–267 | 739.2[1,2] |
| 138 | 19[7] |

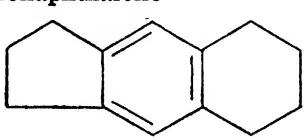
$D_4^{20}$

| | |
|---|---|
| 1.0090[2] | |
| 1.009[1] | |
| 1.0054 | 19.4° [7] |

$n_D^{20}$

| | |
|---|---|
| 1.5538[1,2] | |
| 1.55297 | 19.4° [7] |

**6,7-Cyclopentano-1,2,3,4-tetrahydronaphthalene**

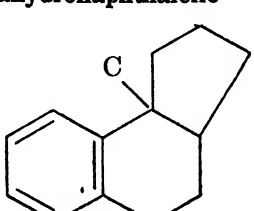


B. P., °C @ 760mm

| | |
|---|---|
| 125–126 | 6[11,12] |
| 104–106 | 3[3] |

### $C_{14}H_{18}$

**1,2-Cyclopentano-1-methyl-1,2,3,4-tetrahydronaphthalene**





B. P., °C @ 760mm

| | |
|---|---|
| 128 | 12[7] |
| 128–132 | 11[9,10] |

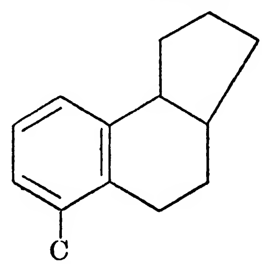
$D_4^{20}$

| | |
|---|---|
| 0.99798 | 17.8° [7] |

$n_D^{20}$

| | |
|---|---|
| 1.5472[9,10] | |
| 1.54790 | 17.8° [7] |

**1,2-Cyclopentano-5-methyl-1,2,3,4-tetrahydronaphthalene**





B. P., °C @ 760mm

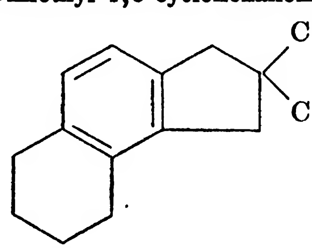
| | |
|---|---|
| 97–99 | 1[8] |

$n_D^{20}$

| | |
|---|---|
| 1.5461 | 21° [8] |

### $C_{15}H_{20}$

**2,2-Dimethyl-4,5-cyclohexanoindane**





B. P., °C @ 760mm

| | |
|---|---|
| 156 | 18[5,6] |

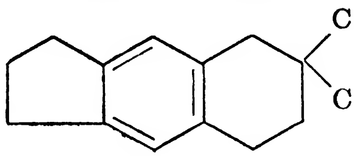
$D_4^{20}$

| | |
|---|---|
| 0.9685 | 18° [5] |

$n_D^{20}$

| | |
|---|---|
| 1.5320[5] | |

**2,2-Dimethyl-6,7-cyclopentano-1,2,3,4-tetrahydronaphthalene**

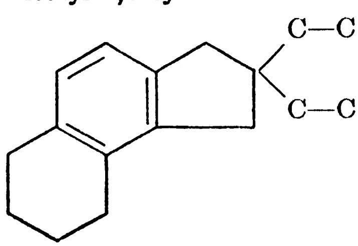


M. P., °C
82[12]

---

$C_{17}H_{24}$

**2,2-Diethyl-4,5-cyclohexanoindane**

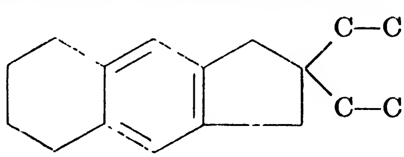


B. P., °C @ 760mm

| | |
|---|---|
| 163–165 | 12[5, 6] |
| 164–166 | 11[13] |

---

**2,2-Diethyl-5,6-cyclohexanoindane**

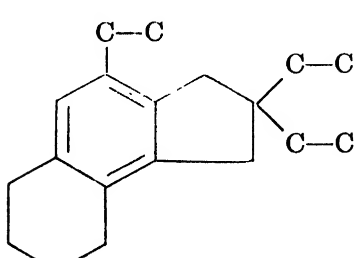


M. P., °C
49[5, 6]

---

$C_{19}H_{28}$

**2,2,7-Triethyl-4,5-cyclohexanoindane**



B. P., °C @ 760mm

| | |
|---|---|
| 203–205 | 19[4] |

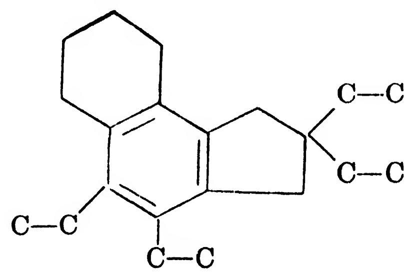
$D_4^{20}$
0.9673[4]

$n_D^{20}$
1.5352[4]

---

$C_{21}H_{32}$

**2,2,4,5-Tetraethyl-6,7-cyclohexanoindane**



B. P., °C @ 760mm

| | |
|---|---|
| 220–222 | 20[4] |

$D_4^{20}$

| | |
|---|---|
| 0.9647 | 27° [4] |

$n_D^{20}$

| | |
|---|---|
| 1.5365 | 27° [4] |

---

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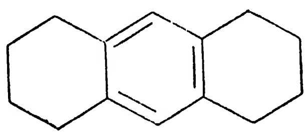
## 6. OCTAHYDROANTHRACENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-10}$

### $C_{14}H_{18}$

**1,2,3,4,5,6,7,8-Octahydroanthracene**
(Octracene)



M. P., °C
73.3
73–74[16, 18]
72–74[12]
73.5[4]
73–73.5[10]
73[15, 21]
72.0–73.0[18]
72–73[1, 8]
71.6[11]
71[17]

B. P., °C @ 760mm
299[1]
293–295[16]

| | |
|---|---|
| 160–163 | 18[8] |
| 167 | 13[1] |
| 167 | 12[16] |

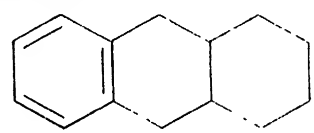
$D_4^{20}$

| | |
|---|---|
| 0.9626 | 91.3°[19] |
| 0.9648 | 88.8°[19] |
| 0.9703 | 80°[21] |
| 1.131 | 0°[22] |

$n_D^{20}$

| | |
|---|---|
| 1.53625 | 88.8°[19] |
| 1.5372 | 80°[21] |
| 1.53230 | $n_{H\alpha}^{88.8}$[19] |
| 1.54791 | $n_{H\beta}^{88.8}$[19] |
| 1.55788 | $n_{H\gamma}^{88.8}$[19] |

**1,2,3,4,4a,9,9a,10-Octahydroanthracene**

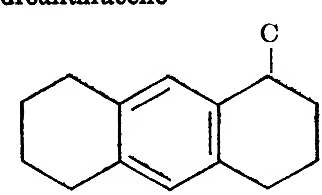


M. P., °C
71[5, 6, 7, 17]
63–64[3]
63.5[14]

B. P., °C @ 760mm
292–295[5, 6, 7]

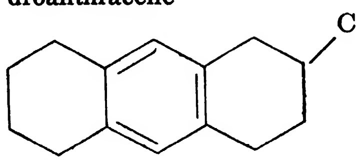
### $C_{15}H_{20}$

**1-Methyl-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C
64–66[20]

**2-Methyl-1,2,3,4,5,6,7,8-octahydroanthracene**



B. P., °C @ 760mm

163–165    13[20]

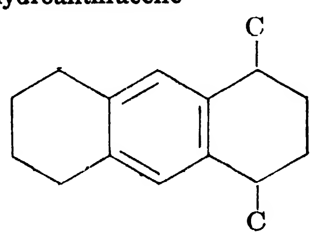
$D_4^{20}$

0.9917    18° [20]

---

$C_{16}H_{22}$

**1,4-Dimethyl-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C

90–92[20]

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**9,10-Dimethyl-x$_8$-octahydroanthracene** (a)

M. P., °C

140–141.5[9]

(a) The structure of this compound was not clearly defined in the literature.

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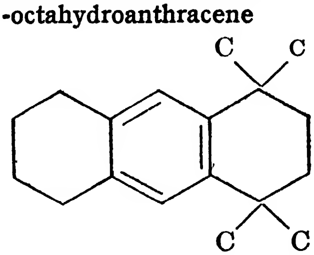
$C_{18}H_{26}$

**1,1,4,4-Tetramethyl-1,2,3,4,5,6,7,8-octahydroanthracene**

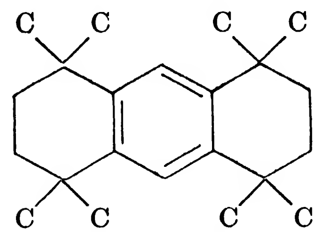


M. P., °C

90–91[2]

$C_{22}H_{34}$

**1,1,4,4,5,5,8,8-Octamethyl-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C

220–222[2]

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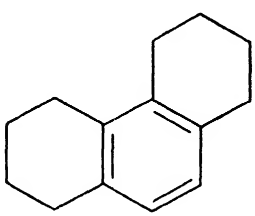
## 7. OCTAHYDROPHENANTHRENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-10}$

### $C_{14}H_{18}$

**1,2,3,4,5,6,7,8-Octahydrophenanthrene**
(Octanthrene)



M. P., °C

16.7[24, 25, 27, 31]
16.6[8]
16.5[26]

B. P., °C @ 760mm

| | |
|---|---|
| 295[24, 25, 36] | |
| 299 | 766[27] |
| 179–180 | 20[31] |
| 172–173 | 20[8] |
| 168 | 16.5[26] |
| 169 | 15[25] |
| 168–172 | 14[25] |
| 167.5 | 13[24, 25, 27] |
| 135–136 | 6[8] |

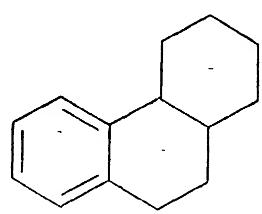
$D_4^{20}$

| | |
|---|---|
| 1.025[35] | |
| 1.026[24, 25] | |
| 1.0313 | 12.8° [35] |

$n_D^{20}$

| | |
|---|---|
| 1.5668[35] | |
| 1.5640 | 25° [8] |
| 1.5669 | 17° [31] |
| 1.57006 | 12.8° [35] |
| 1.56588 | $n_{H\alpha}^{12.8}$ [35] |
| 1.58189 | $n_{H\beta}^{12.8}$ [35] |
| 1.59185 | $n_{H\gamma}^{12.8}$ [35] |

**1,2,3,4,4a,9,10,10a-Octahydrophenanthrene**



M. P., °C

95 (b)[5]

B. P., °C @ 760mm

| | |
|---|---|
| 280–285[3] | |
| 283–284 | 744.5[7] |
| 282–284 | 741[23] |
| 146–147 | 20[14] |
| 159 | 15[4] |
| 149–150 | 13[9] |
| 123–124 | 13[8] |
| 135.5–135.7 (b) (c) | 10.5–10.8[32] |

| | |
|---|---|
| 146–147 | 10[18] |
| 138–139 | 10[14] |
| 142.6–142.8 (a) (b) | 9.2[32] |
| 135 | 9[2] |
| 130 | 7[2] |
| 135–137 | 6.5[10] |
| 94–95 (b) | 1.5[19] |
| 88–90 (a) | 0.1–0.15[5] |

$D_4^{20}$

| | |
|---|---|
| 1.006 (b)[5] | |
| 1.012[23] | |
| 0.997325 | 32°[2] |
| 0.9930 | 30°[2] |
| 0.9828 (b) (c) | 25°[32] |
| 0.9840 (b) | 25°[19] |
| 1.0053 (a) (c) | 25°[32] |
| 1.0067 | 25°[18] |
| 1.0072 (a) | 25°[5] |
| 1.0148 | 17°[7] |
| 0.993 | 15°[3] |
| 1.0164 (a) | 13°[5] |
| 1.006 | 0°[3] |

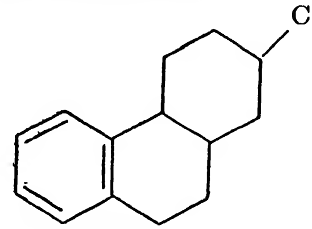
$n_D^{20}$

| | |
|---|---|
| 1.5599[23] | |
| 1.548575 | 32°[2] |
| 1.54940 | 30°[2] |
| 1.5528 | 25°[9, 18] |
| 1.5528 (b) | 20.7°[5] |
| 1.5549 (a) | 20.7°[5] |
| 1.5527 | 19.2°[4] |
| 1.5569 | 17°[7] |
| 1.537 | 15°[3] |
| 1.5452 (b) | 15°[19] |
| 1.5460 (b) (c) | 15°[32] |
| 1.5586 (a) | 12.2°[5] |
| 1.5592 (a) (c) | 10.6°[32] |

(a) This constant was determined on the *cis* isomer of the compound.
(b) This constant was determined on the *trans* isomer of the compound.
(c) This constant was determined on the *dl* form of the compound.

## $C_{15}H_{20}$

### 2-Methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene




B. P., °C @ 760mm

| | |
|---|---|
| 137 | 6[2] |

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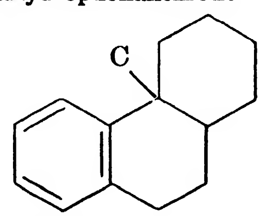
### 4a-Methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene




B. P., °C @ 760mm

| | |
|---|---|
| 155–157 | 18[14] |
| 157 | 16[11] |
| 145–147 | 10[18] |
| 98–100 | 0.5–1.0[15, 16] |

$D_4^{20}$

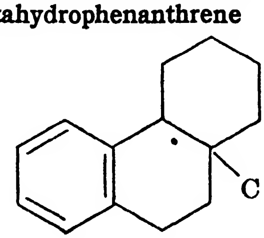
| | |
|---|---|
| 1.0025 | 25°[14] |
| 1.0045 | 25°[18] |
| 1.0082 | 18.2°[11] |

$n_D^{20}$

| | |
|---|---|
| 1.5528[15, 16] | |
| 1.5508 | 25°[15, 16, 18] |
| 1.5559 | 25°[14] |
| 1.55437 | 18.2°[11] |

---

### 10a-Methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene



B. P., °C @ 760mm

| | |
|---|---|
| 133 | 2.8[11] |

$D_4^{20}$

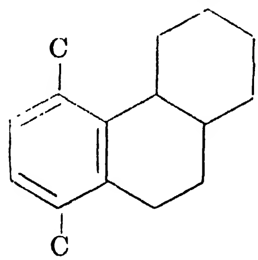
| | |
|---|---|
| 1.0054 | 18.5° [11] |

$n_D^{20}$

| | |
|---|---|
| 1.55254 | 18.5° [11] |

## $C_{16}H_{22}$

**5,8-Dimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**



B. P., °C @ 760mm

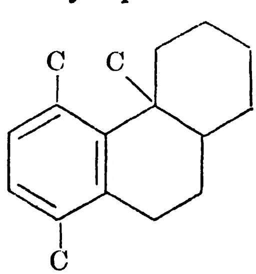
| | |
|---|---|
| 154–156 | 6[20] |

$n_D^{20}$

| | |
|---|---|
| 1.5498 | 25° [20] |

## $C_{17}H_{24}$

**4a,5,8-Trimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 155–156 | 4[20] |

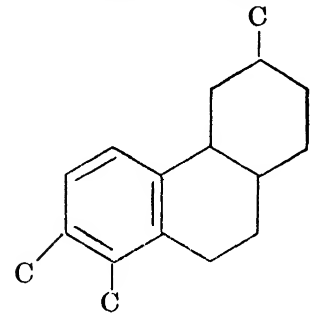
$D_4^{20}$

| | |
|---|---|
| 0.9975 | 25° [20] |

$n_D^{20}$

| | |
|---|---|
| 1.5460 | 25° [20] |

**3,7,8-Trimethyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**

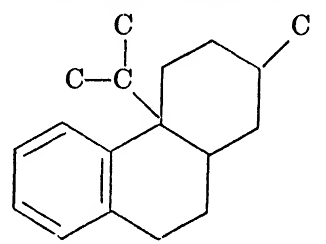


B. P., °C @ 760mm

| | |
|---|---|
| 117–120 | 0.06[22] |

## $C_{18}H_{26}$

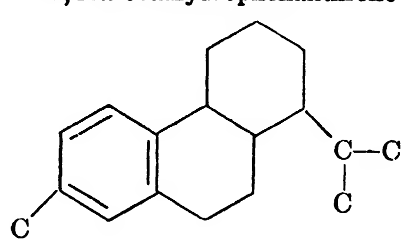
**2-Methyl-4a-isopropyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 123–127 | 2[17] |

**1-Isopropyl-7-methyl-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 195–197.5 | 19[28] |
| 163–165 | 10[1, 34] |
| 195–198 | 9[6] |

$D_4^{20}$

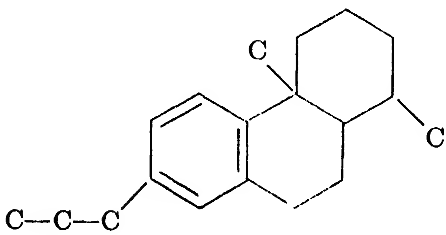
| | |
|---|---|
| 0.9578[1, 34] | |
| 0.9647 | 15° [6] |

$n_D^{20}$

1.53020[34]
1.53023[1, 34]

## $C_{19}H_{28}$

**1,4a-Dimethyl-7-*n*-propyl-1,2,3,4, 4a,9,10,10a-octahydrophenanthrene**
(Pinabietene)



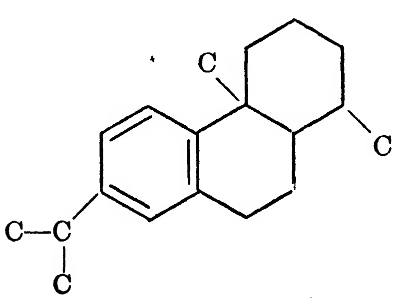
B. P., °C @ 760mm

| | |
|---|---|
| 191–194 | 10[33] |
| 191–193 | 10[33] |

$D_4^{20}$

0.9734[33]
0.9740[33]

**1,4a-Dimethyl-7-isopropyl-1,2,3,4, 4a,9,10,10a-octahydrophenanthrene**
(Abietene)



B. P., °C @ 760mm

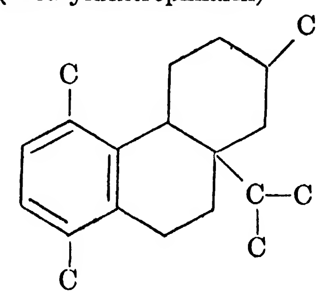
| | |
|---|---|
| 200–202 | 17[12] |
| 200–202 | 14.5[13] |
| 180 | 12[29] |

$n_D^{20}$

| | |
|---|---|
| 1.5354 | 25° [29] |

## $C_{20}H_{30}$

**2,5,8-Trimethyl-10a-isopropyl-1,2,3, 4,4a,9,10,10a-octahydrophenanthrene**
(Methyldextropimarin)



B. P., °C @ 760mm

| | |
|---|---|
| 140–145 | 0.3[21] |

$D_4^{20}$

| | |
|---|---|
| 0.9587 | 22° [21] |

$n_D^{20}$

| | |
|---|---|
| 1.5301 | 22° [21] |

**1,4a,x-Trimethyl-7-isopropyl-1,2,3, 4,4a,9,10,10a-octahydrophenanthrene** (a)
(Methylabietene)

B. P., °C @ 760mm

| | |
|---|---|
| 194–196 | 6[30] |

$D_4^{20}$

| | |
|---|---|
| 0.9661 | 24° [30] |

$n_D^{20}$

| | |
|---|---|
| 1.53836 | 25° [30] |

Additional Data

$[\alpha]_D^{24} = +110.2°$ [30]

(a) The structure of this compound was not clearly defined in the literature.

*References on Octahydrophenanthrenes and Their Alkyl Derivatives*

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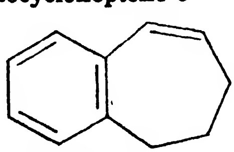
## 8. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-10}$

### $C_{11}H_{12}$

**1,2-Benzocycloheptene-3**



B. P., °C @ 760mm

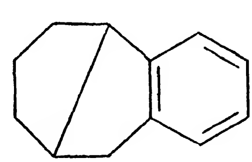
| | |
|---|---|
| 233.5–234 | 757[11] |

$D_4^{20}$

| | |
|---|---|
| 1.009 | 4°[11] |

### $C_{12}H_{14}$

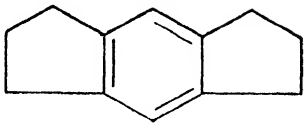
**2,3-Benzobicyclo-[3,3,0]-octane**



B. P., °C @ 760mm

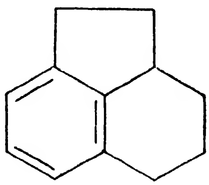
| | |
|---|---|
| 118–124 | 9[3] |

**5,6-Cyclopentanoindane**
(s-Hydrindacene)



M. P., °C
52–54[1]

**2a,3,4,5-Tetrahydroacenaphthene**
(Tetraphthene) (a)



B. P., °C @ 760mm

| | |
|---|---|
| 251[16] | |
| 252[22] | |
| 251–252[12] | |
| 245–248[10] | |
| 249.5 | 719[2,12] |
| 138–139 | 24[8] |
| 115 | 12[21] |
| 112–115 | 12[19] |

$D_4^{20}$

| | |
|---|---|
| 1.0065 | 25°[10] |
| 1.0290 | 21°[8] |
| 1.018 | 15°[19] |

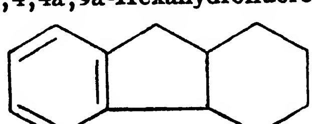
$n_D^{20}$

| | |
|---|---|
| 1.59737[19] | |
| 1.5550 | 25°[10] |
| 1.5777 | 21°[8] |

(a) Reference 21 gives this name and formula. The other references do not clearly define the structure.

## $C_{13}H_{16}$

**1,2,3,4,4a,9a-Hexahydrofluorene**



B. P., °C @ 760mm

| | |
|---|---|
| 137 | 15[4] |
| 127 | 15[5] |

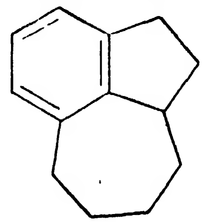
$D_4^{20}$

| | |
|---|---|
| 0.9880[4] | |
| 1.019 | 10.9°[5] |

$n_D^{20}$

| | |
|---|---|
| 1.5448[4] | |
| 1.5572 | 10.9°[5] |

**Cycloheptano-[cd]-indane**
(Homotetraphthene)



B. P., °C @ 760mm

| | |
|---|---|
| 127–128 | 12[23] |

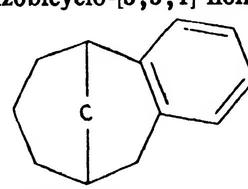
$D_4^{20}$

| | |
|---|---|
| 1.0364 | 17.1°[20] |
| 1.0295 | 15°[23] |

$n_D^{20}$

| | |
|---|---|
| 1.5750 | 22°[23] |
| 1.57362 | $n_{H\alpha}^{17.1}$[20] |
| 1.59350 | $n_{H\beta}^{17.1}$[20] |
| 1.60645 | $n_{H\gamma}^{17.1}$[20] |
| 1.57928 | $n_{He}^{17.1}$[20] |

**2,3-Benzobicyclo-[3,3,1]-nonane**




B. P., °C @ 760mm

| | |
|---|---|
| 123 | 15[5] |
| 85 | 0.3[5] |

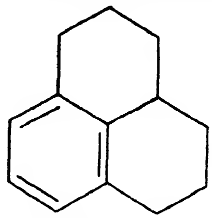
$D_4^{20}$

| | |
|---|---|
| 1.020 | 14.0°[5] |

$n_D^{20}$

| | |
|---|---|
| 1.5580 | 14°[5] |

**3a,4,5,6-Tetrahydrophenalan**



B. P., °C @ 760mm

132–135 14[24]

$D_4^{20}$

1.027 23°[24]

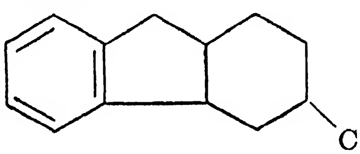
$n_D^{20}$

1.5636 23°[24]

---

$C_{14}H_{18}$

**3-Methyl-1,2,3,4,4a,9a-hexahydrofluorene**




B. P., °C @ 760mm

128 14[26]

$D_4^{20}$

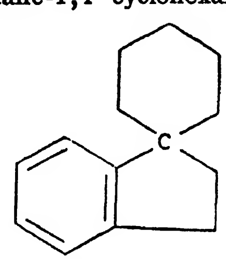
0.99[26]

$n_D^{20}$

1.5455[26]

---

**Spiro[indane-1,1′-cyclohexane]**



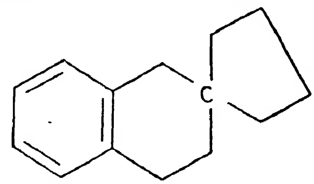

B. P., °C @ 760mm

135.5–135.7 10[14]

$n_D^{20}$

1.5468 25°[14]

**Spiro[1,2,3,4-tetrahydronaphthalene-2,1′-cyclopentane]**

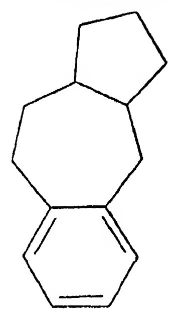



B. P., °C @ 760mm

113–114 4[17]

---

**1,2-Cyclopentano-4,5-benzocycloheptane**
(Octahydrobenzazulene)



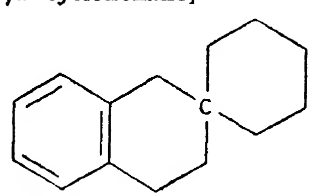
M. P., °C

29–30[6]

---

$C_{15}H_{20}$

**Spiro[1,2,3,4-tetrahydronaphthalene-2,1′-cyclohexane]**




B. P., °C @ 760mm

115–117 3[18]

$D_4^{20}$

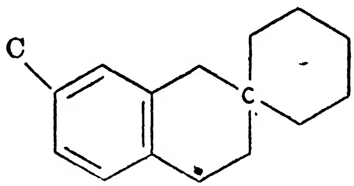
0.98886 30.4°[18]

$n_D^{20}$

1.54314 30°[18]

## $C_{16}H_{22}$

**Spiro[7-methyl-1,2,3,4-tetrahydronaphthalene-2,1'-cyclohexane]**

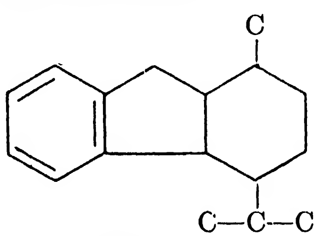


B. P., °C @ 760mm

| | |
|---|---|
| 155–156 | 8[18] |

## $C_{17}H_{24}$

**1-Methyl-4-isopropyl-1,2,3,4,4a,9a-hexahydrofluorene**



B. P., °C @ 760mm

| | |
|---|---|
| 153–155 | 10[25] |
| 150 | 10[15] |
| 105 | 0.6[15] |

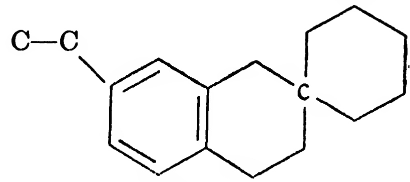
$D_4^{20}$

| | |
|---|---|
| 0.9843 | 21° [15] |

$n_D^{20}$

| | |
|---|---|
| 1.5397 | 21° [15] |

**Spiro[7-ethyl-1,2,3,4-tetrahydronaphthalene-2,1'-cyclohexane]**



B. P., °C @ 760mm

| | |
|---|---|
| 168–169 | 8[18] |

$D_4^{20}$

| | |
|---|---|
| 0.972787 | 24° [18] |

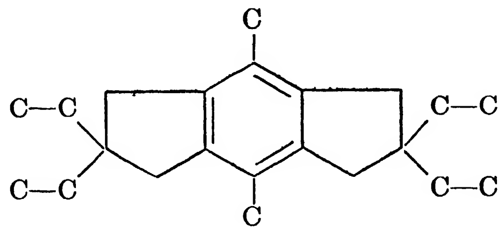
$n_D^{20}$

1.538808[18]

*This series continued on next page*

## $C_{22}H_{34}$

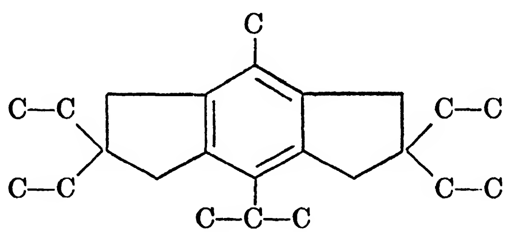
**1,4-Dimethyl-2,3,5,6-di-[2′,1′-(4′,4′-diethylcyclopentano)]-benzene**



M. P., °C
69–71[9]

## $C_{24}H_{38}$

**1-Methyl-4-isopropyl-2,3,5,6-di-[2′,1′-(4′,4′-diethylcyclopentano)]-benzene**



M. P., °C
69–71[7]

B. P., °C @ 760mm

| | |
|---|---|
| 215–220 | 12[7] |

$D_4^{20}$

| | |
|---|---|
| 0.9466 | 22° [7] |

$n_D^{20}$
1.5247[7]

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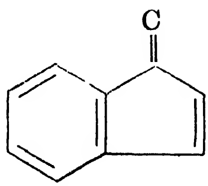
## III. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-12}$

1. Indene with One Alkenyl or One Alkylidene Substitution
2. Naphthalene and Its Alkyl Derivatives
3. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-12}$

## 1. INDENE WITH ONE ALKENYL OR ONE ALKYLIDENE SUBSTITUTION, $C_nH_{2n-12}$

### $C_{10}H_8$

**1-Methyleneindene**



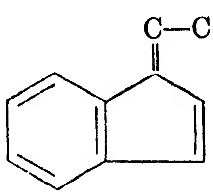
M. P., °C
37[3, 4]

B. P., °C @ 760mm
95–97 17[3]

---

### $C_{11}H_{10}$

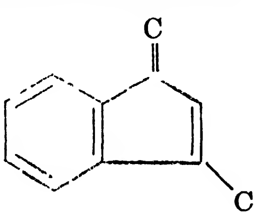
**1-Ethylideneindene**



B. P., °C @ 760mm
119–121 17[3]

---

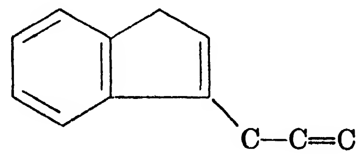
**1-Methylene-3-methylindene**



B. P., °C @ 760mm
102–104 11[8]

### $C_{12}H_{12}$

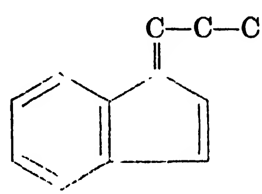
**3-(Propen-2′-yl)-indene**



B. P., °C @ 760mm
138 27[7]

---

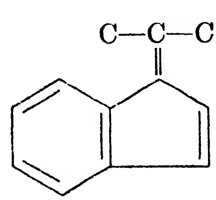
**1-Propylideneindene**



B. P., °C @ 760mm
140–141 20[3]

---

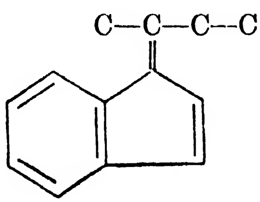
**1-Isopropylideneindene**



B. P., °C @ 760mm
142 16[6]
129–130 8[3]

## $C_{13}H_{14}$

### 1-*sec*-Butylideneindene

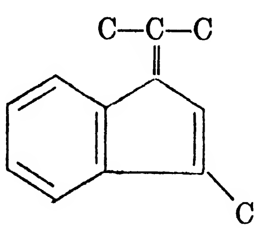


B. P., °C @ 760mm

| | |
|---|---|
| 151–152 | 15[8] |

---

### 1-Isopropylidene-3-methylindene



M. P., °C

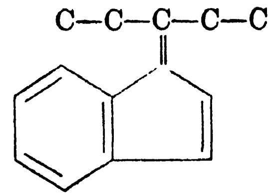
51[2]
49[1]
48–49[9]

B. P., °C @ 760mm

| | |
|---|---|
| 145–148 | 11[1] |
| 144–148 | 11[9] |
| 105 | 0.2–0.5[9] |

## $C_{14}H_{16}$

### 1-(3′-Pentylidene)-indene



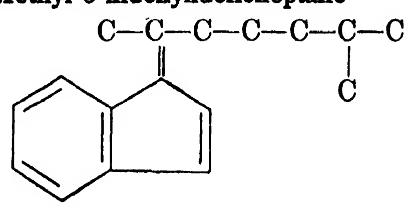
B. P., °C @ 760mm

| | |
|---|---|
| 140–142 | 15[3] |

---

## $C_{17}H_{22}$

### 2-Methyl-6-indenylideneheptane



B. P., °C @ 760mm

| | |
|---|---|
| 120 | 0.2[5] |

$D_4^{20}$

| | |
|---|---|
| 0.9666 | 23° [5] |

$n_D^{20}$

| | |
|---|---|
| 1.5733 | 23° [5] |

---

*References on Indene with One Alkenyl or One Alkylidene Substitution*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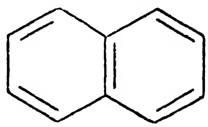
## 2. NAPHTHALENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-12}$

### $C_{10}H_8$

**Naphthalene**



M. P., °C

**80.0$_1$**
81 (a)
80.98 ± 0.15 (b)[225]
80.8[102, 191, 193]
80–80.7[224]
80.6[126]
80.5[44, 114]
80.4–80.5[103]
80.0–80.5[208]
80–80.5[45]
80.4[162, 263]
80.3[117]
80.3 (c)[116]
80.25–80.30[267]
80.24 ± 0.01 (c)[141]
80.23[58]
80.21[58]
80.20[207]
80.2[211, 238, 281]
80.15[27, 140]
80.12[228]
80.10–80.12[229]
80.10[51, 52, 74, 231]
80.1 (d)
80.05–80.1 (c)[266]
79.9–80.1[139]
80.09[268]
80.08[67]
80.05–80.07[17]
80.061 ± 0.002[165]
80.06[39, 137, 147]
80.05[28, 100, 133]
80.04[261]
80.00[40, 94]
80.0[26, 115, 117, 136, 167, 194, 222]
80 (e)
79.9–80[220]
79.5–80.0[209]
79.5–80[216]
79.95[231]
79.91[4, 5]
79.9[18, 19, 168, 210]
79.87[12, 56, 237]
79.866[197]
79.86[88]
79.6–79.8[269]
79.7[150]
79.60–79.64[179]
79.60[143]
79.6[70]
79.5 (f)
79.4[86, 156]
79.33[123]
79.32[123]
79.3[157, 201, 279]
79.25[254]
79.2[6, 110, 206]
79 (g)

| | atm. |
|---|---|
| 190.1 | 3,494 (b)[230, 231] |
| 180.1 | 3,097 (b)[230, 231] |
| 169.8 | 2,724 (b)[231] |
| 170.1 | 2,712 (b)[230] |
| 159.8 | 2,405 (b)[231] |
| 150.1 | 2,061 (b)[230] |
| 148.9 | 2,035 (b)[231] |
| 138.8 | 1,719[231] |
| 138.9 | 1,705 (b)[231] |
| 129.91 | 1,450 (b)[231] |
| 130 | 1,430[11] |
| 129.92 | 1,416[231] |
| 125.01 | 1,325 (b)[231] |
| 119.92 | 1,155[231] |
| 120.1 | 1,151 (b)[230] |
| 115.06 | 1,016 (b)[231] |
| 110.02 | 853[231] |
| 110.01 | 853[231] |

| | |
|---|---|
| 105.71 | 740 (b)[231] |
| 99.98 | 561[231] |
| 100 | 560[11] |
| 95.21 | 429 (b)[231] |
| 91.14 | 300[94] |
| 91.10 | 300[94] |
| 89.11 | 281 (b)[231] |
| 89.97 | 278[231] |
| 90.25 | 275[94] |
| 90 | 275[11] |
| 89.20 | 250[94] |
| 88.35 | 225[94] |
| 87.45 | 200[94] |
| 86.45 | 175[94] |
| 86.01 | 173 (b)[231] |
| 85.50 | 150[94] |
| 84.50 | 125[94] |
| 83.51 | 106 (b)[231] |
| 83.65 | 100[94] |
| 83 | 80[11] |
| 82.80 | 75[94] |
| 81.80 | 50[94] |
| 80.85 | 25[94] |
| 80.10 | 0[231] |
| 79.95 | 0[94] |

B. P., °C @ 760mm

**217.98**
218.47 (b)[55]
218.2[88, 124]
218.12[246]
218.06[42, 55, 100]
218.050 (b)[89]
218.05 (h)
218.04[7]
218.0 ± 0.02[243]
218.0[170, 195, 214, 263, 264]
218 (i)
217.8–218.0[93]
217.98 ± 0.01[250, 263]
$217.97_3$[66]
217.96[39, 90, 147, 242, 249]
217.96 ± 0.03[141]
217.95[73]
217.94[41]
217.9[26]
217.8[169]
217.68[100]

| | |
|---|---|
| 269.51 | 2,149.31[55] |
| 267.03 | 2,052.28[55] |
| 264.45 | 1,957.02[55] |
| 263.01 | 1,912.86[55] |
| 259.26 | 1,784.83[55] |
| 255.65 | 1,657.39[55] |
| 253.93 | 1,600.94[55] |
| 249.92 | 1,489.60[55] |
| 247.58 | 1,413.80[55] |
| 245.99 | 1,378.68[55] |
| 243.98 | 1,317.86[55] |
| 243.32 | 1,306.75[55] |
| 241.34 | 1,252.27[55] |
| 238.79 | 1,184.58[55] |
| 236.25 | 1,111.33[55] |
| 234.68 | 1,086.63[55] |
| 234.50 | 1,082.12[55] |
| 233.94 | 1,070.92[55] |
| 230.86 | 1,002.31[55] |
| 228.55 | 958.26[55] |
| 227.02 | 927.75[55] |
| 225.39 | 894.87[55] |
| 224.1 | 881.0[170] |
| 223.9 | 879.7[170] |
| 223.8 | 878.5[170] |
| 224.45 | 877.29[55] |
| 221.45 | 825.2[175] |
| 221.35 | 816.78[55] |
| 220 | 800[38] |
| 219.95 | 800[100] |
| 219.68 | 795[100] |
| 219.40 | 790[100] |
| 219.11 | 785[100] |
| 218.83 | 780[100] |
| 218.54 | 775[100] |
| 218.25 | 770[100] |
| 217.4–217.8 | 769[154] |
| 218.5 | 767.63[54] |
| 217.97 | 765[100] |
| 218.5 | 763[13] |
| 218.152 (b) | 762.02[89] |

| | |
|---|---|
| 218.047 (b) | 760.37[89] |
| 218.061 (b) | 760.24[89] |
| 217.87 | 759.2[175] |
| 217.34 | 755.8[175] |
| 217.40 | 755[100] |
| 217.6 | 752.20[54] |
| 217 | 751[108] |
| 217.6 | 750.1[88] |
| 217.11 | 750[100] |
| 216.4–216.8 | 747.6[110] |
| 216.82 | 745[100] |
| 216.89 | 744[155] |
| 216.7 | 741.9[187] |
| 216.53 | 740[100] |
| 216.45 | 737.6[170] |
| 216.4 | 737.6[170] |
| 216.7 | 736.99[54] |
| 216.24 | 735[100] |
| 215.95 | 730[100] |
| 215.65 | 725[100] |
| 215.7 | 720.39[54] |
| 215.36 | 720[100] |
| 215.06 | 715[100] |
| 214.76 | 710[100] |
| 215.07 | 708.93[55] |
| 214.45 | 705[100] |
| 214.14 | 700[100] |
| 214 | 700[38] |
| 213.51 | 690[100] |
| 213.30 | 682.7[175] |
| 212.87 | 680[100] |
| 212.23 | 670[100] |
| 212.17 | 667.8[175] |
| 212.06 | 660.16[55] |
| 211.58 | 660[100] |
| 210.94 | 650[100] |
| 210.28 | 640[100] |
| 209.60 | 630[100] |
| 209.83 | 627.85[55] |
| 209.62 | 625.95[55] |
| 208.93 | 620[100] |
| 208.24 | 610[100] |
| 208 | 600[38] |
| 207.55 | 600[100] |
| 206.84 | 590[100] |
| 207.00 | 589.70[55] |
| 206.92 | 584.01[55] |
| 206.00 | 581.9[175] |
| 206.12 | 580[100] |
| 205.78 | 576.2[175] |
| 206.05 | 576.18[55] |
| 205.40 | 570[100] |
| 205.31 | 564.76[55] |
| 204.66 | 560[100] |
| 203.91 | 550[100] |
| 203.15 | 540[100] |
| 203.26 | 538.37[55] |
| 202.37 | 530[100] |
| 202.2 | 520.0[170] |
| 201.59 | 520[100] |
| 202.2 | 519.0[170] |
| 202.1 | 518.5[170] |
| 200.80 | 510[100] |
| 200.50 | 505.7[175] |
| 200 | 502.1[60] |
| 200.00 | 500[100] |
| 200 | 500[38] |
| 199.18 | 490[100] |
| 198.99 | 484.84[55] |
| 198.53 | 482.1[175] |
| 198.34 | 480[100] |
| 197.48 | 470[100] |
| 196.96 | 464.1[175] |
| 196.60 | 460[100] |
| 196.85 | 458.41[55] |
| 196.72 | 458.31[55] |
| 194.78 | 440[100] |
| 193.85 | 430[100] |
| 192.91 | 420[100] |
| 193.05 | 417.97[55] |
| 191.96 | 410[100] |
| 191.00 | 400[100] |
| 191 | 400[38] |
| 191.28 | 398.89[55] |
| 191.20 | 397.68[55] |
| 190.66 | 391.40[55] |
| 190.02 | 390[100] |
| 189.02 | 380[100] |

| | | | |
|---|---|---|---|
| 188.36 | 369.77[55] | 115 | 32.40[10] |
| 187.43 | 358.98[55] | 113.0 | 32.2[170] |
| 185.34 | 347.6[175] | 109.65 | 28.7[175] |
| 184.90 | 337.43[55] | 110 | 27.30[10] |
| 184.56 | 334.20[55] | 104.39 | 22.9[175] |
| 183.89 | 326.22[55] | 105 | 22.40[10] |
| 181.20 | 310.6[175] | 102 | 20[38] |
| 180.80 | 300.82[55] | 100 | 18.50[10] |
| 180 | 300[38] | 100.00 | 18.5[175] |
| 180 | 299.1[60] | 100 | 18.5[3, 60] |
| 178.44 | 290.0[175] | 98.1 | 18.3[170] |
| 179.39 | 289.22[55] | 95 | 15.50[10] |
| 178.92 | 286.60[55] | 95.00 | 15.5[175] |
| 178.41 | 281.55[55] | 95 | 15.5[3] |
| 178.0 | 275.2[170] | 90 | 12.60[10] |
| 177.11 | 272.34[55] | 90 | 12.6[3] |
| 177.3 | 269.7[170] | 87.47 | 11.9[175] |
| 175.10 | 260.8[175] | 87.4 | 11.9[170] |
| 173.14 | 243.53[55] | 87.2 | 11.4[170] |
| 172.05 | 235.21[55] | 87 | 10[38] |
| 171.23 | 231.16[55] | 85 | 9.80[10] |
| 166 | 200[38] | 85 | 9.8[3] |
| 163.13 | 187.1[175] | 80 | 7.40[10] |
| 163.9 | 181.8[170] | 80 | 7.4[3] |
| 160 | 172[13] | 75 | 5.43[3] |
| 160 | 168.4[60] | 74 | 5[38] |
| 160.9 | 168.1[170] | 70 | 4[38] |
| 158.95 | 165.1[175] | 70 | 3.95[3] |
| 149.7 | 117.9[170] | 70 | 3.9[146] |
| 148.7 | 114.5[170] | 65 | 2.65[3] |
| 147.8 | 111.4[170] | 60 | 1.83[3] |
| 144.45 | 103.5[175] | 59.76 | 1.780[238] |
| 144 | 100[38] | 55 | 1.26[3] |
| 140 | 88.7[60] | 55 | 1[146] |
| 138 | 80[38] | 50 | 0.815[221] |
| 133.72 | 71.2[175] | 50 | 0.81[3] |
| 132.6 | 67.0[170] | 49.94 | 0.801[238] |
| 131.1 | 63.2[170] | 44.86 | 0.526[238] |
| 130 | 61.90[10] | 45 | 0.518[221] |
| 130.25 | 61.2[170] | 45 | 0.51[3] |
| 128.06 | 58.7[175] | 40 | 0.35[146] |
| 128.51 ± 0.10 | 57.78[141] | 40 | 0.320[221] |
| 117.15 | 38.3[175] | 39.70 | 0.320[238] |
| 114.70 | 35.9[175] | 40 | 0.32[3] |

| | |
|---|---|
| 34.60 | 0.218[238] |
| 35 | 0.210[221] |
| 35 | 0.21[3] |
| 35 | 0.195[153] |
| 30 | 0.135[3] |
| 30 | 0.133[221] |
| 29.62 | 0.128[238] |
| 25 | 0.103[3] |
| 24.80 | 0.0845[238] |
| 25 | 0.082[221] |
| 20 | 0.080[3] |
| 15 | 0.062[3] |
| 20 | 0.06[153] |
| 20 | 0.0545(b)[10, 37] |
| 20 | 0.054[221] |
| 19.86 | 0.0500[238] |
| 10 | 0.047[3] |
| 15 | 0.0376(b)[10] |
| 15 | 0.035[221] |
| 5 | 0.034[3] |
| 12.98 | 0.0233[238] |
| 0 | 0.023(b)[10] |
| 0 | 0.022[3] |
| 10 | 0.021[221] |
| 5 | 0.010[221] |
| 0 | 0.006[221] |
| 0 | 0.00538[238] |

$D_4^{20}$

| | |
|---|---|
| **0.9628$_3$** | **100°** |
| 1.035[120] | |
| 1.036[120] | |
| 1.110[26] | |
| 1.152 (solid)[212] | |
| 1.158 (solid)[215] | |
| 1.172 (solid)[171] | |
| 1.175 (solid)[203] | |
| 0.889 | 187.8° [217] |
| 0.8962 | 177.2° [64] |
| 0.912 | 164.8° [217] |
| 0.9212 | 152° [122] |
| 0.9400 | 127.0° [64] |
| 0.9456 | 120° [68] |
| 0.95040 (b) | 115° [147] |
| 0.9632 | 100.86° [88] |
| 0.9630 | 100.04° [88] |
| 0.9609 | 100° [68] |
| 0.96248 (b) | 100° [147] |
| 0.9643 | 99.8° [255] |
| 0.9641 | 99.6° [256] |
| 0.9645 | 99.6° [120, 255] |
| 0.9629 | 99.5° [121] |
| 0.9631 | 99.3° [121] |
| 0.9630 | 99.2° [121] |
| 0.9628 | $D_0^{99\ 02}$ [4, 5] |
| 0.9634$_5$ (b) | 99.0° [219] |
| 0.96208 | 98.4° [174] |
| 0.9621 | 98.4° [33] |
| 1.0056 | $D_{95}^{95}$ [195] |
| 0.9696 | 91.45° [27] |
| 0.9685 | 90° [68] |
| 0.9696 | 90° [122] |
| 0.97056 (b) | 90° [147] |
| 0.9715 | 87.29° [88] |
| 0.9757 | 85.30° [261] |
| 0.9752 ± 0.0002 | 85° [141] |
| 0.9757 | 85° [255] |
| 1.0070 | $D_{85}^{85}$ [195] |
| 0.9746 | 84.55° [27] |
| 0.9766 (b) | 82.2° [219] |
| 0.97703 (b) | 82° [147] |
| 0.9759 | 81.92° [88] |
| 0.9771 | 80.76° [88] |
| 0.9790 | 80° [122] |
| 0.9777 | 79.9° [72] |
| 0.9778 | 79.2° [220] |
| 0.9790 | 78.45° [27] |
| 0.9799 | 77.35° [27] |
| 0.9813 | 75.04° [27] |
| 0.9830 | 72.61° [27] |
| 0.9850 | 70.10° [27] |
| 0.9877 | 66.71° [27] |
| 0.9991 | 50° [68] |
| 1.1675 (solid) | 31.51° [27] |
| 1.149 | 25° [119] |
| 1.1789 (b) | 23.9° [87] |
| 1.168 | 22° [75] |
| 1.170 | 18° [75] |

| | |
|---|---|
| 1.1589 (solid) | 17° [59] |
| 1.1708 (solid) | 15.71° [27] |
| 1.1517 | 15° [92] |
| 1.15173 | 15° [254] |
| 1.1788 (solid) | 8.31° [27] |
| 1.0373 | 0° [68] |
| 1.2355 (solid) | −188° [59] |
| $n_D^{20}$ | |
| **1.5821$_4$** | **100°** |
| 1.618[120] | |
| 1.619[120] | |
| 1.5330 | 187.8° [217] |
| 1.5467 | 164.8° [217] |
| 1.5695 | 124.8° [217] |
| 1.5760 | 111.3° [217] |
| 1.58218 | 99.6° [120, 255] |
| 1.58269 | 99.6° [256] |
| 1.58291 | 99.5° [121] |
| 1.58276 | 99.3° [121] |
| 1.58276 | 99.2° [121] |
| 1.58232 | 98.4° [174] |
| 1.58987 | 85.30° [273] |
| 1.58996 | 85.30° [261] |
| 1.5898 ± 0.0002 | 85° [141] |
| 1.5917 | 82.8° [217] |
| 1.601 | 80° [83] |
| 1.57472 | $n_{H\alpha}^{99.6}$ [120, 255] |
| 1.57509 | $n_{H\alpha}^{99.6}$ [256] |
| 1.57535 | $n_{H\alpha}^{99.5}$ [121] |
| 1.57524 | $n_{H\alpha}^{99.3}$ [121] |
| 1.57520 | $n_{H\alpha}^{99.2}$ [121] |
| 1.57456 | $n_{H\alpha}^{98.4}$ [174] |
| 1.5746 | $n_{H\alpha}^{98.4}$ [33] |
| 1.57375 | $n_{H\alpha}^{85}$ [255] |
| 1.60328 | $n_{H\beta}^{99.6}$ [120, 255] |
| 1.60378 | $n_{H\beta}^{99.6}$ [256] |
| 1.60401 | $n_{H\beta}^{99.5}$ [121] |
| 1.60387 | $n_{H\beta}^{99.3}$ [121] |
| 1.60386 | $n_{H\beta}^{99.2}$ [121] |
| 1.60310 | $n_{H\beta}^{98.4}$ [174] |
| **1.62261** | $n_{H\gamma}^{99.6}$ [120, 255] |
| 1.62295 | $n_{H\gamma}^{99.6}$ [256] |

(j)

Additional Data

Crit. Temp. (°C)

474[84]

468.2[78, 85]

468.0[265]

Crit. Pressure (mm Hg)

29,792.0[85]

$t_m = 79.975 + 0.03614\, p_{atm} - 0.000001187\, p_{atm}^2$

(1 to 3,500 atm)

$\frac{1}{T_b} = 0.00326573 - 0.00042695 \log_{10} p_{mm}$

(900 to 2,150 mm)

$\frac{1}{T_b} = 0.00324419 - 0.00041936 \log_{10} p_{mm}$

(300 to 900 mm)

$\frac{1}{T_b} = 0.00320848 - 0.00040522 \log_{10} p_{mm}$

(35 to 300 mm)

$\frac{dD}{dt} = -0.00077163\,[1 + 0.001933\,(t - 100)]/°C$

(60 to 190°C)

$\frac{dn}{dt} = -0.0005509/°C$

(80 to 190°C)

(a) The melting point 81 is found in references 14, 15, 91, 112, 145, 192, 199, 262.

(b) This constant is the average of two or more determinations.

(c) This constant was given as a freezing point in the literature.

(d) The melting point 80.1 is found in references 65, 163, 170, 196, 219, 227, 231, 242, 272.

(e) The melting point 80 is found in references 1, 10, 16, 24, 29, 30, 31, 32, 34, 36, 46, 49, 53, 61, 72, 76,

80, 95, 97, 101, 104, 105, 107, 109, 118, 119, 121, 122, 125, 127, 144, 149, 158, 160, 166, 172, 174, 176, 177, 180, 181, 183, 186, 200, 202, 212, 215, 218, 223, 226, 232, 233, 239, 241, 244, 245, 247, 248, 252, 257, 259, 271, 275, 276, 278, 280, 282.

(f) The melting point 79.5 is found in references 25, 43, 158, 164, 183, 184, 213.

(g) The melting point 79 is found in references 2, 8, 9, 20, 21, 22, 35, 47, 57, 62, 63, 69, 77, 79, 81, 82, 92, 98, 111, 135, 138, 142, 151, 152, 159, 178, 182, 185, 190, 204, 205, 234, 245, 247, 251, 253, 256, 258, 270, 274, 277.

(h) The boiling point 218.05 is found in references 7, 128, 129, 130, 131, 132, 133, 240.

(i) The boiling point 218 is found in references 13, 20, 21, 22, 23, 38, 57, 71, 92, 99, 101, 106, 113, 119, 134, 148, 152, 160, 161, 188, 189, 198, 235, 236, 244, 247, 248, 252, 260, 265, 269.

(j) Refractive indices at other lines are found in reference 173.

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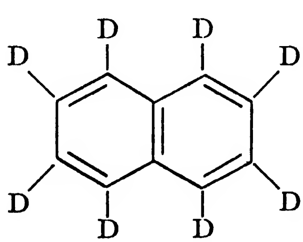
## Octadeuteronaphthalene



M. P., °C
80–81[50]
77.5[48]

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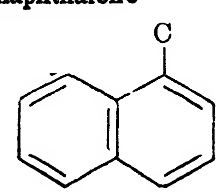
## $C_{11}H_{10}$

### 1-Methylnaphthalene



M. P., °C

- **−30.9**
- −30.77 ± 0.06[19]
- −30.90 ± 0.01 (a)[61]
- −31[25]
- −31.9[19]
- −33−−31[67]
- −33−−32[20]

B. P., °C @ 760mm

- **244.74**
- 244.8[80]
- 244.78[19]
- 244.78 ± 0.10[61]
- 244.6[55]
- 244.4[25]
- 243–244[16]
- 242.5–243.5[40]
- 240.4–242.6[35]
- 241–242[66, 110]

| | |
|---|---|
| 244–245 | 766[20] |
| 243.5–244.1 | 763[65] |
| 241.5–242 | 749[77] |
| 151.3 ± 0.2 | 57.8[61] |
| 148.9 | 56[19] |
| 145 | 55[2] |
| 121–123 | 20[108] |
| 117–120 | 12–13[56] |
| 108.6–108.8 | 11[35] |
| 108–109 | 10[41] |
| 100–105 | 10[1] |
| 14.6 | 0.031[60] |

$D_4^{20}$

- **1.0120**
- 1.020[25]
- 1.0212[112]

| | |
|---|---|
| 0.9606 | 100.2° [109] |
| 0.9644 | 100.1° [112] |
| 0.9604 | 100.0° [109] |
| 0.9611 | 100° [25] |
| 0.9632 | 100.0° [112] |
| 0.9606 | 99.5° [109] |
| 0.9617 | 99.4° [109] |
| 0.9771 | 78.3° [112] |
| 0.9979 | 50° [25] |
| 1.0163 ± 0.0001 | 25° [61] |
| 1.0163 ± 0.0002 | 25° [39] |
| 1.0158 | 24.7° [107] |
| 1.0181 | 24.0° [112] |
| 1.0182 | 23.9° [112] |
| 1.0172 | 23.3° [109] |
| 1.0170 | 22.6° [109] |
| 1.0182 | 21.6° [109] |
| 1.0182 | 21.3° [109] |
| 1.0190 | 20.9° [109] |
| 1.0188 | 20.6° [109] |
| 1.0192 | 20.5° [109] |
| 1.0192 | 19.8° [111] |
| 1.0195 | 19.8° [109] |
| 1.0209 | 19.7° [112] |
| 1.0211 | 19.7° [112] |
| 1.0218 | 19.3° [112] |
| 1.0219 | 19.2° [112] |
| 1.0218 | 18.9° [112] |
| 1.02085 | 18.2° [109] |
| 1.0216 | 18.2° [112] |
| 1.0223 | 18.2° [112] |
| 1.0217 | 17.8° [109] |
| 1.0229 | 17.6° [112] |
| 1.0212 | 17.0° [111] |
| 1.0234 | 17° [41] |
| 1.0225 | 16.8° [112] |
| 1.0250 | 14.4° [112] |
| 1.0248 | 13.6° [110] |
| 1.0259 | 13.6° [112] |
| 1.0267 | 11.5° [118] |
| 1.0347 | 0° [25] |

$n_D^{20}$

- 1.6157[20]
- 1.6167[77]
- 1.6172[25]

| | |
|---|---|
| 1.58077 | 99.2° [110] |
| 1.5882 | 40° [116] |
| 1.6140 ± 0.0002 | 25° [39] |
| 1.6145 | 25° [25] |
| 1.61494 ± 0.00010 | 25° [61] |
| 1.6165 | 18.5° [74] |
| 1.6175 | 17° [41] |
| 1.6197 | 15° [25] |

| | |
|---|---|
| 1.62124 | 13.6° [110] |
| 1.57226 | $n_{\mathrm{H}\alpha}^{100.2}$ [109] |
| 1.57225 | $n_{\mathrm{H}\alpha}^{100.1}$ [112] |
| 1.57226 | $n_{\mathrm{H}\alpha}^{100.0}$ [109] |
| 1.57252 | $n_{\mathrm{H}\alpha}^{100.0}$ [112] |
| 1.57244 | $n_{\mathrm{H}\alpha}^{99.5}$ [109] |
| 1.57235 | $n_{\mathrm{H}\alpha}^{99.4}$ [109] |
| 1.57353 | $n_{\mathrm{H}\alpha}^{99.2}$ [110] |
| 1.58292 | $n_{\mathrm{H}\alpha}^{78.3}$ [112] |
| 1.60677 ± 0.00010 | $n_{\mathrm{H}\alpha}^{25}$ [61] |
| 1.60687 | $n_{\mathrm{H}\alpha}^{24.7}$ [107] |
| 1.60750 | $n_{\mathrm{H}\alpha}^{24.0}$ [112] |
| 1.60754 | $n_{\mathrm{H}\alpha}^{23.9}$ [112] |
| 1.60786 | $n_{\mathrm{H}\alpha}^{23.3}$ [109] |
| 1.60811 | $n_{\mathrm{H}\alpha}^{22.6}$ [109] |
| 1.60846 | $n_{\mathrm{H}\alpha}^{21.6}$ [109] |
| 1.60846 | $n_{\mathrm{H}\alpha}^{21.3}$ [109] |
| 1.59156 | $n_{\mathrm{H}\alpha}^{20.9}$ [109] |
| 1.60881 | $n_{\mathrm{H}\alpha}^{20.6}$ [109] |
| 1.60909 | $n_{\mathrm{H}\alpha}^{20.5}$ [109] |
| 1.60900 | $n_{\mathrm{H}\alpha}^{20.0}$ [112] |
| 1.60919 | $n_{\mathrm{H}\alpha}^{19.8}$ [111] |
| 1.60927 | $n_{\mathrm{H}\alpha}^{19.8}$ [109] |
| 1.60909 | $n_{\mathrm{H}\alpha}^{19.7}$ [112] |
| 1.60944 | $n_{\mathrm{H}\alpha}^{19.7}$ [112] |
| 1.60932 | $n_{\mathrm{H}\alpha}^{19.3}$ [112] |
| 1.60936 | $n_{\mathrm{H}\alpha}^{19.2}$ [112] |
| 1.60980 | $n_{\mathrm{H}\alpha}^{18.9}$ [112] |
| 1.60980 | $n_{\mathrm{H}\alpha}^{18.2}$ [112] |
| 1.60989 | $n_{\mathrm{H}\alpha}^{18.2}$ [112] |
| 1.61007 | $n_{\mathrm{H}\alpha}^{18.2}$ [109] |
| 1.61051 | $n_{\mathrm{H}\alpha}^{17.8}$ [109] |
| 1.61015 | $n_{\mathrm{H}\alpha}^{17.6}$ [112] |
| 1.60997 | $n_{\mathrm{H}\alpha}^{17.2}$ [112] |
| 1.61052 | $n_{\mathrm{H}\alpha}^{17.0}$ [111] |
| 1.61042 | $n_{\mathrm{H}\alpha}^{16.9}$ [112] |
| 1.61051 | $n_{\mathrm{H}\alpha}^{16.8}$ [112] |
| 1.61051 | $n_{\mathrm{H}\alpha}^{16.7}$ [112] |
| 1.61126 | $n_{\mathrm{H}\alpha}^{15.0}$ [112] |
| 1.61130 | $n_{\mathrm{H}\alpha}^{14.9}$ [112] |
| 1.61121 | $n_{\mathrm{H}\alpha}^{14.4}$ [112] |
| 1.61174 | $n_{\mathrm{H}\alpha}^{13.6}$ [112] |
| 1.61300 | $n_{\mathrm{H}\alpha}^{13.6}$ [110] |
| 1.60025 | $n_{\mathrm{H}\beta}^{100.2}$ [109] |
| 1.60018 | $n_{\mathrm{H}\beta}^{100.1}$ [112] |
| 1.60034 | $n_{\mathrm{H}\beta}^{100.0}$ [109] |
| 1.60043 | $n_{\mathrm{H}\beta}^{99.5}$ [109] |
| 1.60285 | $n_{\mathrm{H}\beta}^{99.4}$ [109] |
| 1.60159 | $n_{\mathrm{H}\beta}^{99.2}$ [110] |
| 1.63672 ± 0.00010 | $n_{\mathrm{H}\beta}^{25}$ [61] |
| 1.63680 | $n_{\mathrm{H}\beta}^{24.7}$ [107] |
| 1.63740 | $n_{\mathrm{H}\beta}^{24.0}$ [112] |
| 1.63744 | $n_{\mathrm{H}\beta}^{23.9}$ [112] |
| 1.63776 | $n_{\mathrm{H}\beta}^{23.3}$ [109] |
| 1.63800 | $n_{\mathrm{H}\beta}^{22.6}$ [109] |
| 1.63844 | $n_{\mathrm{H}\beta}^{21.6}$ [109] |
| 1.63844 | $n_{\mathrm{H}\beta}^{21.3}$ [109] |
| 1.61969 | $n_{\mathrm{H}\beta}^{20.9}$ [109] |
| 1.63878 | $n_{\mathrm{H}\beta}^{20.6}$ [109] |
| 1.63905 | $n_{\mathrm{H}\beta}^{20.5}$ [109] |
| 1.63895 | $n_{\mathrm{H}\beta}^{20.0}$ [112] |
| 1.63931 | $n_{\mathrm{H}\beta}^{19.8}$ [109, 111] |
| 1.63913 | $n_{\mathrm{H}\beta}^{19.7}$ [112] |
| 1.63947 | $n_{\mathrm{H}\beta}^{19.7}$ [112] |
| 1.63935 | $n_{\mathrm{H}\beta}^{19.3}$ [112] |
| 1.63939 | $n_{\mathrm{H}\beta}^{19.2}$ [112] |
| 1.63983 | $n_{\mathrm{H}\beta}^{18.9}$ [112] |
| 1.64000 | $n_{\mathrm{H}\beta}^{18.2}$ [112] |
| 1.64009 | $n_{\mathrm{H}\beta}^{18.2}$ [109] |
| 1.64052 | $n_{\mathrm{H}\beta}^{17.8}$ [109] |
| 1.64026 | $n_{\mathrm{H}\beta}^{17.6}$ [112] |
| 1.64008 | $n_{\mathrm{H}\beta}^{17.2}$ [112] |
| 1.64060 | $n_{\mathrm{H}\beta}^{17.0}$ [111] |
| 1.64050 | $n_{\mathrm{H}\beta}^{16.9}$ [112] |
| 1.64068 | $n_{\mathrm{H}\beta}^{16.8}$ [112] |

| | |
|---|---|
| 1.64050 | $n_{H\beta}^{16.7}$ [112] |
| 1.64143 | $n_{H\beta}^{15.0}$ [112] |
| 1.64147 | $n_{H\beta}^{14.9}$ [112] |
| 1.64146 | $n_{H\beta}^{14.4}$ [112] |
| 1.64214 | $n_{H\beta}^{13.6}$ [112] |
| 1.64329 | $n_{H\beta}^{13.6}$ [110] |
| 1.62067 | $n_{H\gamma}^{99.2}$ [110] |
| 1.65852 | $n_{H\gamma}^{21.6}$ [109] |
| 1.65852 | $n_{H\gamma}^{21.3}$ [109] |
| 1.66024 | $n_{H\gamma}^{18.2}$ [112] |
| 1.66106 | $n_{H\gamma}^{16.8}$ [112] |
| 1.66372 | $n_{H\gamma}^{13.6}$ [110] |
| 1.5800 | $n_{He}^{100.2}$ [109] |
| 1.57990 | $n_{He}^{100.1}$ [112] |
| 1.5801 | $n_{He}^{100.0}$ [109] |
| 1.58027 | $n_{He}^{100.0}$ [112] |
| 1.5803 | $n_{He}^{99.5}$ [109] |
| 1.5802 | $n_{He}^{99.4}$ [109] |
| 1.59095 | $n_{He}^{78.3}$ [112] |
| 1.61527 | $n_{He}^{24.7}$ [107] |
| 1.61589 | $n_{He}^{24.0}$ [112] |
| 1.61593 | $n_{He}^{23.9}$ [112] |
| 1.6162 | $n_{He}^{23.3}$ [109] |
| 1.6165 | $n_{He}^{22.6}$ [109] |
| 1.6168 | $n_{He}^{21.6}$ [109] |
| 1.6168 | $n_{He}^{21.3}$ [109] |
| 1.6172 | $n_{He}^{20.9}$ [109] |
| 1.6172 | $n_{He}^{20.6}$ [109] |
| 1.6174 | $n_{He}^{20.5}$ [109] |
| 1.61738 | $n_{He}^{20.0}$ [112] |
| 1.61757 | $n_{He}^{19.8}$ [111] |
| 1.6176 | $n_{He}^{19.8}$ [109] |
| 1.61747 | $n_{He}^{19.7}$ [112] |
| 1.61782 | $n_{He}^{19.7}$ [112] |
| 1.61770 | $n_{He}^{19.3}$ [112] |
| 1.61774 | $n_{He}^{19.2}$ [112] |
| 1.61818 | $n_{He}^{18.9}$ [112] |
| 1.61836 | $n_{He}^{18.2}$ [112] |
| 1.61837 | $n_{He}^{18.2}$ [112] |
| 1.61844 | $n_{He}^{18.2}$ [109] |
| 1.6188 | $n_{He}^{17.8}$ [109] |
| 1.61862 | $n_{He}^{17.6}$ [112] |
| 1.61844 | $n_{He}^{17.2}$ [112] |
| 1.61898 | $n_{He}^{17.0}$ [111] |
| 1.61879 | $n_{He}^{16.9}$ [112] |
| 1.61907 | $n_{He}^{16.8}$ [112] |
| 1.61888 | $n_{He}^{16.7}$ [112] |
| 1.61972 | $n_{He}^{15.0}$ [112] |
| 1.61976 | $n_{He}^{14.9}$ [112] |
| 1.61985 | $n_{He}^{14.4}$ [112] |
| 1.62038 | $n_{He}^{13.6}$ [112] |

Additional Data

$dD/dt = -0.0007437/°C$

(0 to 50°C)

(a) This constant was given as a freezing point in the literature.

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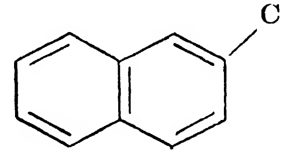
**2-Methylnaphthalene**




M. P., °C

$34.4_4$

36.6–37.2[35]

37[27, 36]

35.5[40]

35.1[116]

35[38, 76]

34.5[25, 54, 71]

34.44 ± 0.01 (a)[61]

34.1[43, 75]

34[23, 65]

32.5–33[66]

32–33[73, 106]

32.5[56, 96, 98, 115, 119]

31.5–32.5[110]

32 (b)

B. P., °C @ 760mm

| | |
|---|---|
| **$241.1_4$** | |
| 241–243[74] | |
| 242[6] | |
| 241–242[29, 96, 115] | |
| 240–242[5, 74] | |
| 241.14[19] | |
| 241.14 ± 0.05[61] | |
| 241.1[80] | |
| 240–241[121] | |
| 240–242 | 770[69] |
| 241–242 | 759[119] |
| 148.07 ± 0.05 | 57.78[61] |
| 147 | 50[38] |
| 110–112 | 16[3] |
| 110.2–111.4 | 13[35] |

$D_4^{20}$

| | |
|---|---|
| 0.883 | 174° [93] |
| 0.891 | 170° [37] |
| 0.912 | 142.5° [93] |
| 0.930 | 120° [37] |
| 0.932 | 111.7° [93] |
| 0.9491 | 99.4° [110] |
| 0.961 | 80° [37] |
| 0.9718 | 70° [25] |
| 0.985 | 50° [37] |
| 0.99045 ± 0.00002 | 40° [61] |
| 0.9939 | 39.9° [110] |
| 1.0043 | 22° [78] |

$n_D^{20}$

| | |
|---|---|
| $1.528_6$ | 174° [93] |
| 1.551 | 142.5° [93] |
| $1.569_5$ | 111.7° [93] |
| 1.5750 | 99.8° [94] |
| 1.57426 | 99.4° [110] |
| $1.586_4$ | 78.5° [93] |
| 1.5864 | 78.3° [94] |
| 1.5965 | 50° [25] |
| $1.599_7$ | 49° [93] |
| 1.5997 | 48.8° [94] |
| 1.6015 | 40° [25] |
| 1.60192 ± 0.00010 | 40° [61] |
| 1.6028 | 40° [116] |
| 1.60263 | 39.9° [110] |
| $1.605_6$ | 34° [93] |
| 1.6056 | 33.8° [94] |
| 1.56724 | $n_{H\alpha}^{99.4}$ [110] |
| 1.59407 ± 0.00010 | $n_{H\alpha}^{40}$ [61] |
| 1.59499 | $n_{H\alpha}^{39.9}$ [110] |
| 1.59454 | $n_{H\beta}^{99.4}$ [110] |
| 1.62306 ± 0.00010 | $n_{H\beta}^{40}$ [61] |
| 1.62395 | $n_{H\beta}^{39.9}$ [110] |
| 1.64284 | $n_{H\gamma}^{39.9}$ [110] |

(a) This constant was given as a freezing point in the literature.
(b) The melting point 32 is found in references 5, 15, 16, 63, 97, 103, 118.

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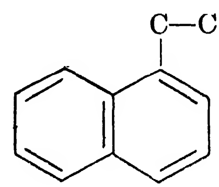
## $C_{12}H_{12}$

**1-Ethylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 258–259[45] | |
| 257–259[120] | |
| 256–259[32] | |
| 257–259.5 | 757.7[12] |
| 256.5 | 756[59] |
| 247–249 | 742[33] |
| 112–116 | 9[31] |
| 100 | 2–3[12] |

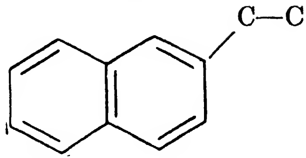
$D_4^{20}$

| | |
|---|---|
| 1.0123[31] | |
| 1.0111 | 14.2° [59] |
| 1.0123 | $D_0^{11.9}$ [12] |
| 1.0204 | $D_0^0$ [12] |
| 1.0221 | $D_0^0$ [59] |

$n_D^{20}$

| | |
|---|---|
| 1.6075[31] | |
| 1.6089 | 14.2° [59] |

**2-Ethylnaphthalene**



M. P., °C

−7-−6.5[57]
−7.5[58]

B. P., °C @ 760mm

| | |
|---|---|
| **251.5** | |
| 252[52, 58] | |
| 251–252[28, 114] | |
| 250–252[14] | |
| 251[45, 62] | |
| 250–251[9] | |
| 249–254 | 750[81] |
| 248 | 725[9] |
| 173–175 | 50[97] |
| 122–125 | 14[26] |
| 117–120 | 12[114] |
| 117–118 | 10[3] |

$D_4^{20}$

| | |
|---|---|
| 0.9958 | 15° [57, 58] |
| 1.0015 | $D_0^{25}$ [72] |
| 1.0078 | 0° [62] |
| 1.0069 | $D_0^{0}$ [57, 58] |

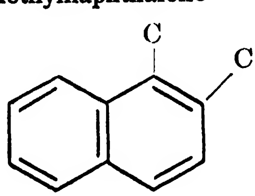
$n_D^{20}$

| | |
|---|---|
| 1.591 | 25° [72] |
| 1.6028 | 15° [57, 58] |

(a)

(a) Refractive indices at other lines are found in reference 57.

**1,2-Dimethylnaphthalene**



M. P., °C

−3.5[22]

B. P., °C @ 760mm

| | |
|---|---|
| 266–267[51] | |
| 265 | 770[22] |
| 265–266 | 752[51] |
| 264 | 749[30] |
| 144 | 22[110] |
| 148–149 | 18[95] |
| 139–140 | 15[95] |
| 135–136 | 14[42] |
| 137 | 13[64] |
| 131.5 | 12[30] |
| 120 | 0.02[82] |

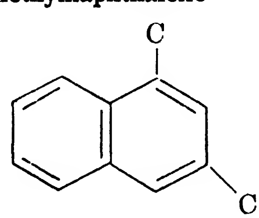
$D_4^{20}$

| | |
|---|---|
| 1.011[64] | |
| 1.015[51] | |
| 1.019[30] | |
| 1.0118 | 19.0° [64] |
| 1.025 | 16.6° [95] |
| 1.0219 | 16.35° [110] |

$n_D^{20}$

| | |
|---|---|
| 1.6135[51] | |
| 1.6142[64] | |
| 1.61461 | 19° [64] |
| 1.61795 | 16.35° [110] |
| 1.60691 | $n_{H\alpha}^{19}$ [64] |
| 1.61014 | $n_{H\alpha}^{16.35}$ [110] |
| 1.63613 | $n_{H\beta}^{19}$ [64] |
| 1.63945 | $n_{H\beta}^{16.35}$ [110] |
| 1.65976 | $n_{H\gamma}^{16.35}$ [110] |

**1,3-Dimethylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 248–250[41] | |
| 262–264 | 746[102] |
| 124–126 | 10[41] |
| 107 | 1[4] |

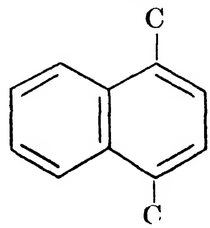
$D_4^{20}$

| | |
|---|---|
| 1.01997 | 15° [41] |

$n_D^{20}$

| | |
|---|---|
| 1.6130 | 15° [41] |

### 1,4-Dimethylnaphthalene



M. P., °C

15–17[102, 105]
5.5–6.5[79]

B. P., °C @ 760mm

| | |
|---|---|
| 264–266[66] | |
| 265[68] | |
| 264[4] | |
| 262–264 | 751[11] |
| 262.5–263 | 742[10] |
| 145 | 40[68] |
| 118 | 10[79] |
| 110 | 6[34] |

$D_4^{20}$

| | |
|---|---|
| **1.0157** | |
| 1.0157[34] | |
| 0.97411 | 77.7° [68] |
| 1.01058 | 27.7° [68] |
| 1.0106 | 27.7° [7, 8] |
| 1.0176 | $D_{20}^{20}$ [34] |
| 1.01803 | 16.4° [68] |
| 1.0199 | 12° [11] |
| 1.0283 | 0° [11] |

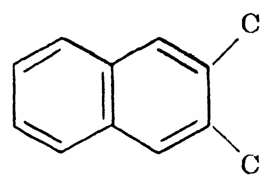
$n_D^{20}$

| | |
|---|---|
| 1.58656 | 77.7° [68] |
| 1.61052 | 27.7° [68] |
| 1.61567 | 16.4° [68] |
| 1.57901 | $n_{H\alpha}^{77.7}$ [68] |
| 1.60250 | $n_{H\alpha}^{27.7}$ [68] |
| 1.6025 | $n_{H\alpha}^{27.7}$ [8] |
| 1.60765 | $n_{H\alpha}^{16.4}$ [68] |
| 1.60710 | $n_{H\beta}^{77.7}$ [68] |
| 1.62200 | $n_{H\beta}^{27.7}$ [68] |
| 1.63722 | $n_{H\beta}^{16.4}$ [68] |
| 1.65117 | $n_{H\gamma}^{27.7}$ [68] |

Additional Data

$dD/dt = -0.00072025/°C$
(0 to 78°C)

### 2,3-Dimethylnaphthalene



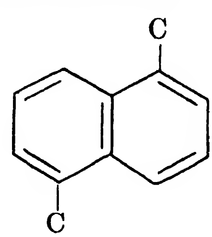
M. P., °C

**104**
104–105[117]
104–104.5[95]
104[4, 122]
102[100]

B. P., °C @ 760mm

| | |
|---|---|
| 265–266 | 767[48] |

### 1,5-Dimethylnaphthalene



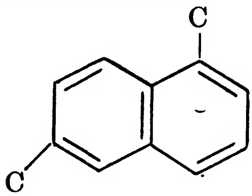
M. P., °C

82[49, 50]
80–80.5[1]
77–78[104]

B. P., °C @ 760mm

| | |
|---|---|
| 265.5[49] | |
| 265–265.5 | 761[50] |

### 1,6-Dimethylnaphthalene



M. P., °C

97[99]

B. P., °C @ 760mm

262–264[69]

262–263[47, 118]

262.5[13]

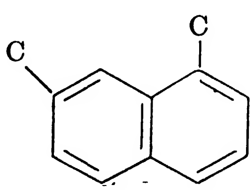
$D_4^{20}$

| | |
|---|---|
| 1.0049 | 16.3° [110] |
| 1.0056 | 15° [118] |

$n_D^{20}$

| | |
|---|---|
| 1.60886 | 16.3° [110] |
| 1.60119 | $n_{H\alpha}^{16.3}$ [110] |
| 1.63021 | $n_{H\beta}^{16.3}$ [110] |
| 1.64958 | $n_{H\gamma}^{16.3}$ [110] |

### 1,7-Dimethylnaphthalene



M. P., °C

84–85[101]

B. P., °C @ 760mm

| | |
|---|---|
| 261–262[52] | |
| 258[4] | |
| 147–149 | 15[21] |

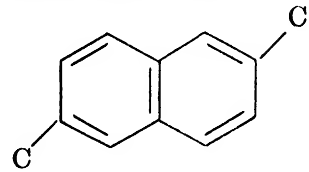
$D_4^{20}$

1.0115[52]

$n_D^{20}$

1.60831[52]

### 2,6-Dimethylnaphthalene



M. P., °C

**110.5**

113[69]

111[17]

110–111[17, 44, 63, 113, 118]

110.5[40]

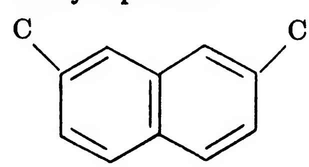
110[13, 23, 53]

109[88]

B. P., °C @ 760mm

| | |
|---|---|
| 261–263[44] | |
| 261–262[69] | |
| 260–261 | 767[48] |
| 261–262 | 762[118] |

### 2,7-Dimethylnaphthalene



M. P., °C

**97**

98.5[83]

98[86]

97–98[90]

96.5–97.5[70]

97[46, 83, 89, 97]

96–97[83, 91, 92, 118]

96.5[24]

96[23, 84]

94–95[87]

94[69, 85]

B. P., °C @ 760mm

| | |
|---|---|
| 265[18] | |
| 262 | 758[118] |
| 128–130 | 12[85] |

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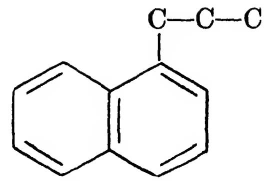
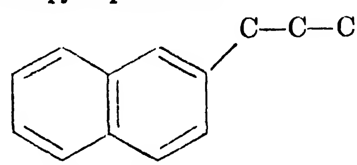
## $C_{13}H_{14}$

### 1-*n*-Propylnaphthalene



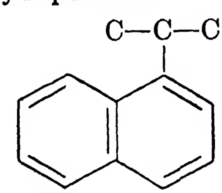
B. P., °C @ 760mm
275–276[61]
274–275[4, 5]

### 2-*n*-Propylnaphthalene



B. P., °C @ 760mm
277–279[4, 5]

### 1-Isopropylnaphthalene



| B. P., °C @ | 760mm |
|---|---|
| 264–266[9] | |
| 263–264 | 769[22] |
| 132 | 12[22] |
| 132–134 | 10[38, 39] |

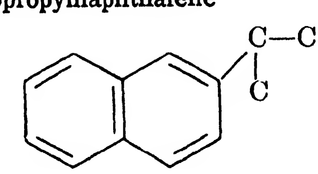
$D_4^{20}$

| | |
|---|---|
| 0.90075 | 15° [38] |

$n_D^{20}$

| | |
|---|---|
| 1.5728 | 15° [39] |
| 1.5775 | 15° [38] |

### 2-Isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 268[86] | |
| 263–265[22] | |
| 262[86] | |
| 265 | 755[62] |
| 145 | 25[62] |
| 129–130 | 14[2] |
| 125 | 12[65] |
| 99–100 | 0.2[8] |

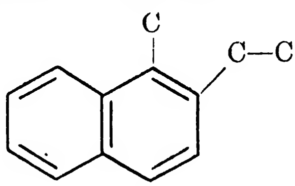
$D_4^{20}$

| | |
|---|---|
| 0.9795[86] | |
| 0.974 | $D_{25}^{25}$ [59] |
| 0.990 | 0° [62] |

$n_D^{20}$

| |
|---|
| 1.5772[86] |
| 1.5775[59] |
| 1.5784[86] |

## 1-Methyl-2-ethylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 137.5–140 | 12[45] |
| 140–145 | 11[15] |

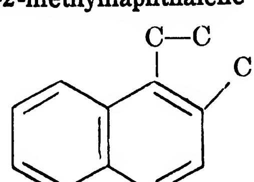
$D_4^{20}$

| | |
|---|---|
| 1.0014 | 15.4° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.599[45] | |
| 1.60138 | 15.4° [45] |
| 1.59422 | $n_{H\alpha}^{15.4}$ [45] |
| 1.62151 | $n_{H\beta}^{15.4}$ [45] |
| 1.63995 | $n_{H\gamma}^{15.4}$ [45] |

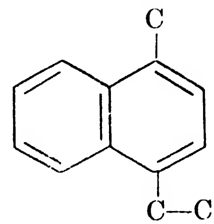
## 1-Ethyl-2-methylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 135–145 | 11[15] |

## 1-Methyl-4-ethylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 122 | 10[30] |
| 138–140 | 12[45] |

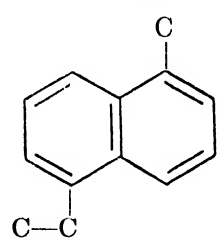
$D_4^{20}$

| | |
|---|---|
| 1.0086 | 13.1° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.60571 | 13.1° [45] |
| 1.59839 | $n_{H\alpha}^{13.1}$ [45] |
| 1.62624 | $n_{H\beta}^{13.1}$ [45] |
| 1.64490 | $n_{H\gamma}^{13.1}$ [45] |

## 1-Methyl-5-ethylnaphthalene



M. P., °C

40[36]

B. P., °C @ 760mm

| | |
|---|---|
| 140 | 12[77] |
| 133 | 10[36] |

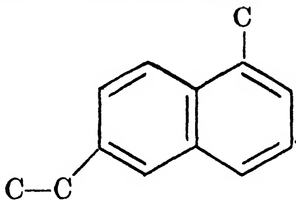
$D_4^{20}$

| | |
|---|---|
| 1.011 | 18° [77] |

$n_D^{20}$

| | |
|---|---|
| 1.600 | 30° [36] |
| 1.6082 | 18° [77] |

**1-Methyl-6-ethylnaphthalene**



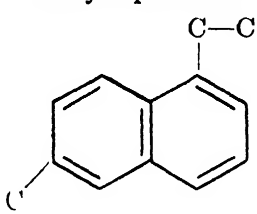
B. P., °C @ 760mm

| | |
|---|---|
| 146 | 14[58] |
| 140 | 12[36] |

$n_D^{20}$

1.598[36]

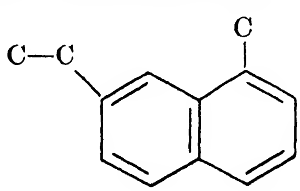
**1-Ethyl-6-methylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 135–138 | 12[14] |

**1-Methyl-7-ethylnaphthalene**



M. P., °C

96–97[20]

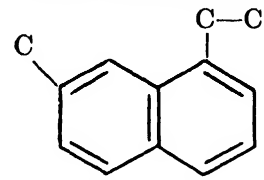
B. P., °C @ 760mm

| | |
|---|---|
| 133–138 | 16[52] |
| 130–135 | 16[84] |
| 134.5–136 | 12[79] |
| 134–136 | 12[79] |
| 133 | 12[36] |

$n_D^{20}$

1.5970[36]

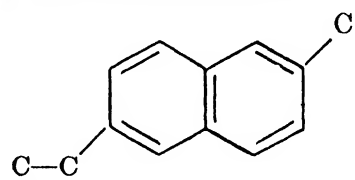
**1-Ethyl-7-methylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 128 | 11[14] |

**2-Methyl-6-ethylnaphthalene**



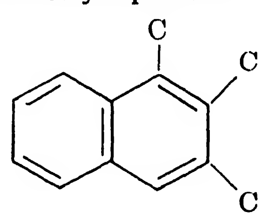
M. P., °C

44–45[44]

B. P., °C @ 760mm

| | |
|---|---|
| 145–150 | 11[16] |

**1,2,3-Trimethylnaphthalene**



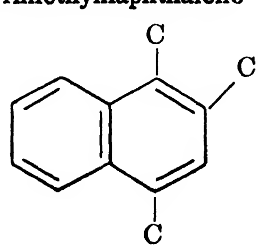
M. P., °C

27–28[40]

B. P., °C @ 760mm

| | |
|---|---|
| 125–130 | 12[66] |

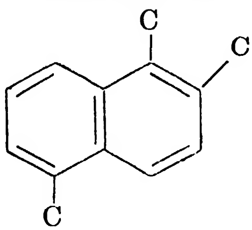
**1,2,4-Trimethylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 146 | 12[66] |

## 1,2,5-Trimethylnaphthalene



M. P., °C

31–32[69]

−5[34]

B. P., °C @ 760mm

| | |
|---|---|
| 148–149 | 16[70] |
| 147–148 | 16[70] |
| 147–148 | 11[69] |
| 101–103 | 1.5[34] |
| 113–115 | 0.5[41] |
| 120 | 0.2[80] |

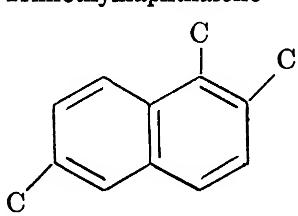
$D_4^{20}$

| | |
|---|---|
| 1.0103 | 22° [69] |
| 1.008 | 15° [70] |
| 1.011 | 15° [70] |

$n_D^{20}$

| | |
|---|---|
| 1.6093 | 22° [69] |
| 1.6092 | 15° [70] |
| 1.6093 | 15° [70] |

## 1,2,6-Trimethylnaphthalene



M. P., °C

14[87]

B. P., °C @ 760mm

| | |
|---|---|
| 154–156 | 15[89] |
| 146 | 10[66] |
| 119–123 | 10[76] |

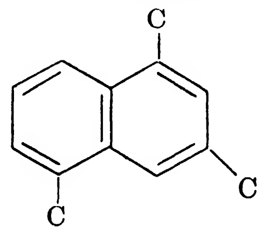
$D_4^{20}$

0.935[76]

$n_D^{20}$

1.521[76]

## 1,3,5-Trimethylnaphthalene



M. P., °C

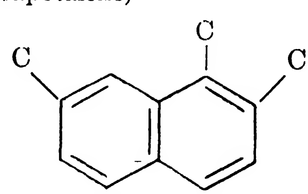
47[37]

43[66]

B. P., °C @ 760mm

| | |
|---|---|
| 139.5 | 10[66] |

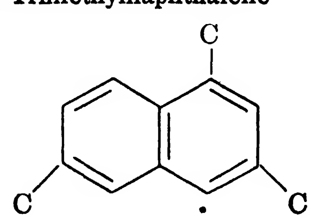
## 1,2,7-Trimethylnaphthalene
(Sapotalene)



B. P., °C @ 760mm

| | |
|---|---|
| 160–163 | 16[17] |
| 143 | 13[66] |
| 140–145 | 12[53] |
| 133 | 10[18] |

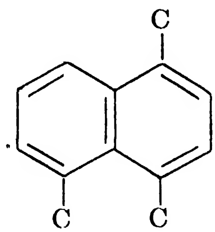
## 1,3,6-Trimethylnaphthalene



B. P., °C @ 760mm

140–144 10[66]

## 1,4,5-Trimethylnaphthalene



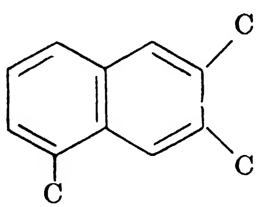
M. P., °C

63[7, 66]

B. P., °C @ 760mm

145 12[66]

## 2,3,5-Trimethylnaphthalene



M. P., °C

28[7, 81]

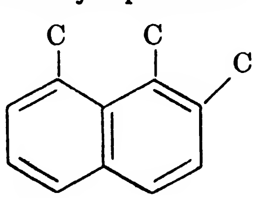
25.3[47]

B. P., °C @ 760mm

285[47]

138 12[66]

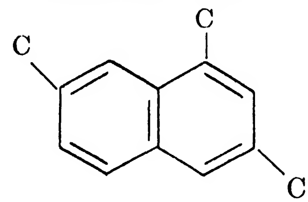
## 1,2,8-Trimethylnaphthalene



B. P., °C @ 760mm

150 16[66]

## 1,3,7-Trimethylnaphthalene



M. P., °C

13.5[46, 48]

B. P., °C @ 760mm

280[18]

280 764[46]

131–133 9[66]

$D_4^{20}$

1.007[46]

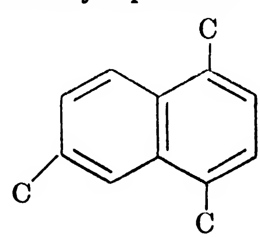
0.9801 21° [66]

$n_D^{20}$

1.57589[16]

1.5972 15.5° [66]

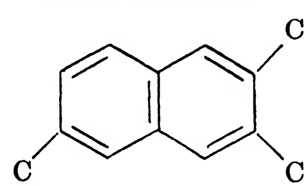
## 1,4,6-Trimethylnaphthalene



B. P., °C @ 760mm

140–142 15[66]

## 2,3,6-Trimethylnaphthalene



M. P., °C

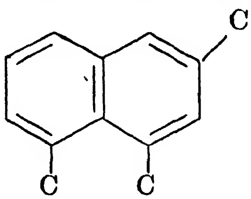
102[34, 46, 48]

92–93[21, 23]

B. P., °C @ 760mm

| | |
|---|---|
| 286[48] | |
| 263–264[21] | |
| 286 | 762[46] |
| 146–148 | 14[66] |
| 104–105 | 1.5[34] |

**2,4,5-Trimethylnaphthalene**

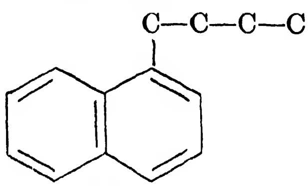


M. P., °C

48[37]

## $C_{14}H_{16}$

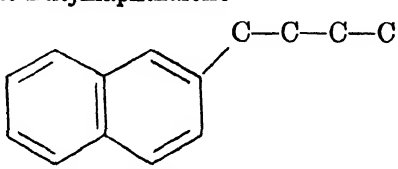
**1-*n*-Butylnaphthalene**



B. P., °C @ 760mm

281–283[4, 5]

**2-*n*-Butylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 283–285[4, 5] | |
| 282.5–283.5 | 745[56] |
| 125–130 | 13[50] |

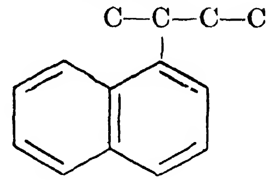
$D_4^{20}$

0.9659[56]

$n_D^{20}$

1.5790[56]

**1-*sec*-Butylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 111–113 | 2[86] |
| 105–107 | 2[86] |

$D_4^{20}$

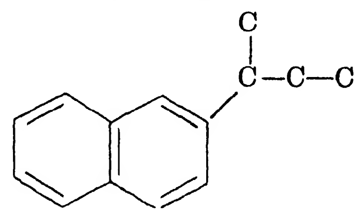
0.9746[86]

0.9749[86]

$n_D^{20}$

1.5698[86]

**2-*sec*-Butylnaphthalene**



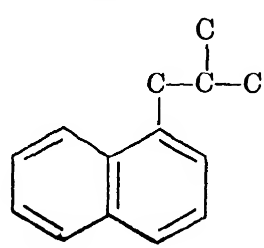
B. P., °C @ 760mm

| | |
|---|---|
| 147–148 | 33[8] |

$n_D^{20}$

1.5814[8]

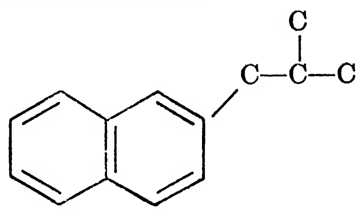
**1-Isobutylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 136–138 | 11[27] |

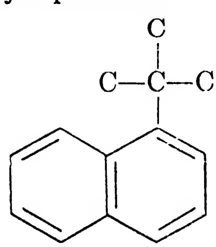
## 2-Isobutylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 112–113 | 6[27] |

## 1-*tert*-Butylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 287–289[86] | |
| 114–118 | 3[49] |

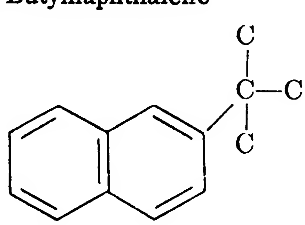
$D_4^{20}$

0.9629[86]

$n_D^{20}$

1.5726[86]

## 2-*tert*-Butylnaphthalene



M. P., °C

−4[90]

B. P., °C @ 760mm

| | |
|---|---|
| 274–276[86] | |
| 274–277 | 756[13] |
| 272–275 | 745[56] |
| 137–139 | 17[13] |
| 145 | 15[90] |
| 142–143 | 14[83] |
| 140–145 | 13[59] |
| 127–131 | 9[32] |
| 115 | 6[90] |
| 125 | 4[13] |

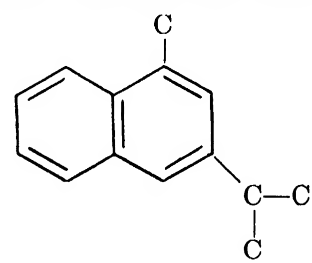
$D_4^{20}$

| | |
|---|---|
| 0.9674[56] | |
| 09687[86] | |
| 0.979 | $D_{25}^{25}$ [59] |

$n_D^{20}$

1.5685[59]
1.5768[86]
1.5795[90]
1.5812[56]

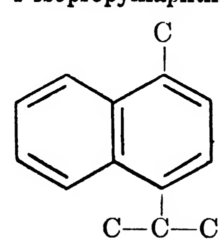
## 1-Methyl-3-isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 150 | 11[26] |

## 1-Methyl-4-isopropylnaphthalene



M. P., °C

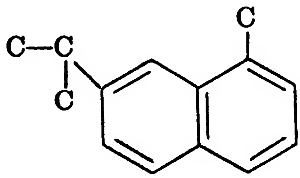
196[30]

B. P., °C @ 760mm

| | |
|---|---|
| 148 | 16[6] |
| 145–148 | 12[60] |

| | | |
|---|---|---|
| $D_4^{20}$ | 0.9934 | 14.5° [60] |
| $n_D^{20}$ | 1.5907 | 14.5° [60] |

**1-Methyl-7-isopropylnaphthalene**
(Eudalene)



B. P., °C @ 760mm

| | |
|---|---|
| 281[7] | |
| 280–281 | 730[64] |
| 280–281 | 720[71] |
| 152 | 18[24] |
| 142–143 | 12[71] |
| 142 | 12[71] |
| 140 | 11[78] |

$D_4^{20}$

| | |
|---|---|
| 0.9734 | 17° [71] |
| 0.9737 | 17° [78] |
| 0.9747 | 16° [71] |

$n_D^{20}$

| | |
|---|---|
| 1.5847 | 17° [71] |
| 1.5849 | 17° [78] |
| 1.5850 | 16° [71] |

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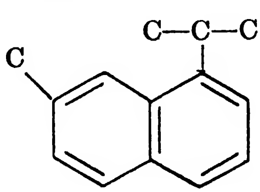
**1-Isopropyl-7-methylnaphthalene**
(Apocadalene)



B. P., °C @ 760mm

| | |
|---|---|
| 282[7] | |
| 139–141 | 12[72] |

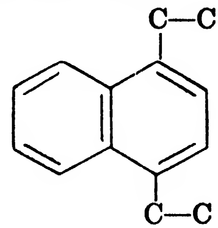
$D_4^{20}$

0.9833[72]

$n_D^{20}$

1.5884[72]

**1,4-Diethylnaphthalene**



M. P., °C

16.5–17[1]

B. P., °C @ 760mm

| | |
|---|---|
| 165 | 25[1] |
| 150–152.5 | 12[45] |
| 136–139 | 9[33] |

$D_4^{20}$

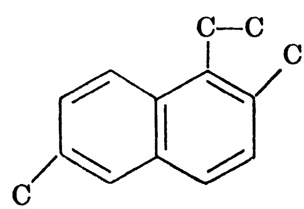
| | |
|---|---|
| 0.993[33] | |
| 0.9983 | 13.1° [45] |

$n_D^{20}$

| | |
|---|---|
| 1.601[33] | |
| 1.59699 | 13.1° [45] |
| 1.59005 | $n_{H\alpha}^{13.1}$ [45] |
| 1.61642 | $n_{H\beta}^{13.1}$ [45] |
| 1.63423 | $n_{H\gamma}^{13.1}$ [45] |

---

**1-Ethyl-2,6-dimethylnaphthalene**

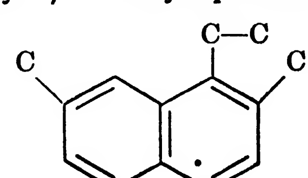


B. P., °C @ 760mm

| | |
|---|---|
| 162 | 23[31] |

---

**1-Ethyl-2,7-dimethylnaphthalene**

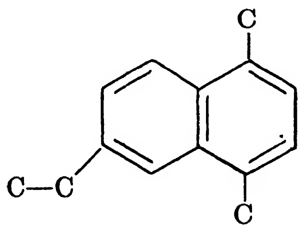


B. P., °C @ 760mm

140–142 12[67]

---

**1,4-Dimethyl-6-ethylnaphthalene**



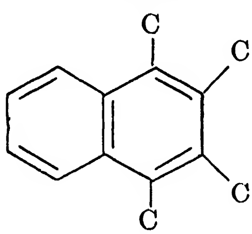
B. P., °C @ 760mm

298–302[35]

115 0.5[68]

---

**1,2,3,4-Tetramethylnaphthalene**



M. P., °C

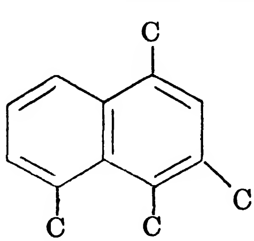
107–108[57]

106.5–107.5[10]

104–105[12]

---

**1,3,4,5-Tetramethylnaphthalene**

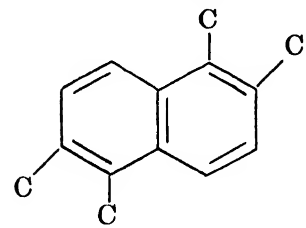


B. P., °C @ 760mm

150 10[67]

---

**1,2,5,6-Tetramethylnaphthalene**



M. P., °C

**116.4**

118[18]

116–117[53, 74]

116–116.5[67, 74]

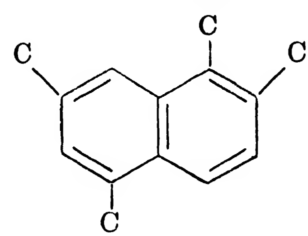
116[63]

B. P., °C @ 760mm

150–155 12[67]

---

**1,2,5,7-Tetramethylnaphthalene**

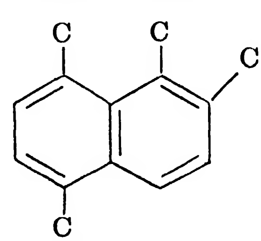


B. P., °C @ 760mm

155–158 12[42]

---

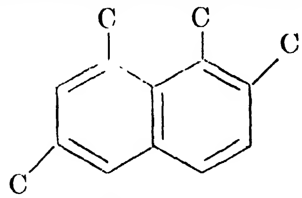
**1,2,5,8-Tetramethylnaphthalene**



B. P., °C @ 760mm

150 9[67]

**1,2,6,8-Tetramethylnaphthalene**

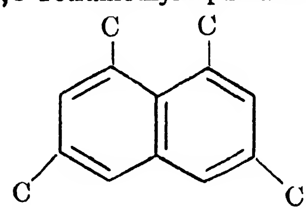


B. P., °C @ 760mm

166–168  15[67]

---

**1,3,6,8-Tetramethylnaphthalene**



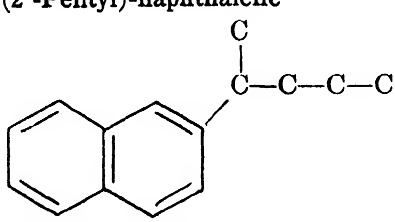
M. P., °C

84–85[85]

---

## $C_{15}H_{18}$

**2-(2′-Pentyl)-naphthalene**



B. P., °C @ 760mm

130–131  5[49]

---

**1-Isopentylnaphthalene** (a)

B. P., °C @ 760mm

287–289[49]

(a) The structure of this compound was not clearly defined in the literature.

---

**2-Isopentylnaphthalene** (a)

M. P., °C

108–110[54]

B. P., °C @ 760mm

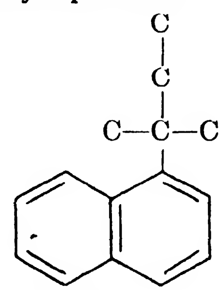
289–292[54]

140  12[82]

(a) The structure of this compound was not clearly defined in the literature.

---

**1-*tert*-Pentylnaphthalene**



B. P., °C @ 760mm

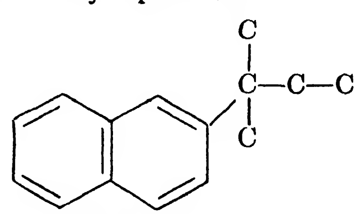
301–303[86]

$D_4^{20}$

0.9751[86]

---

**2-*tert*-Pentylnaphthalene**



B. P., °C @ 760mm

287–290[86]

$D_4^{20}$

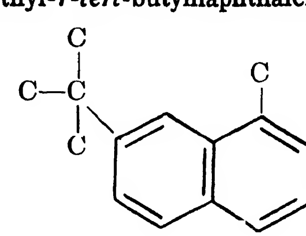
0.9751[86]

$n_D^{20}$

1.5772[86]

---

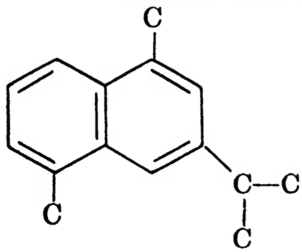
**1-Methyl-7-*tert*-butylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 151–152 | 14[25] |

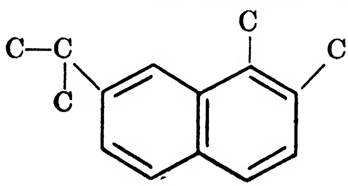
### 1,5-Dimethyl-3-isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 110–112 | 0.8[73] |

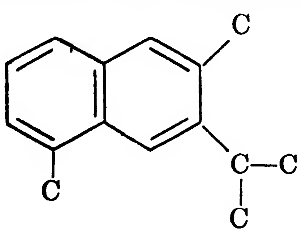
### 1,2-Dimethyl-7-isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 149–151 | 9[10] |

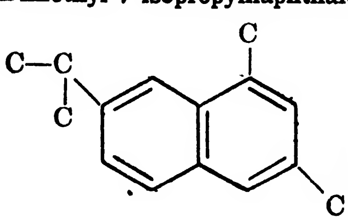
### 2,5-Dimethyl-3-isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 154–158 | 13[10] |

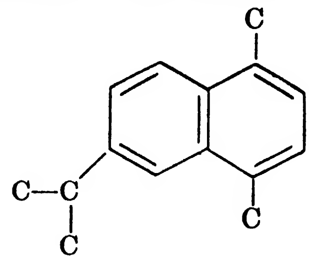
### 1,3-Dimethyl-7-isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 165–167 | 19[11] |

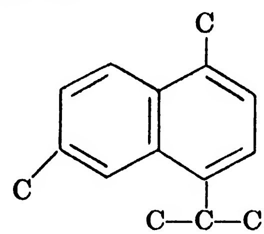
### 1,4-Dimethyl-6-isopropylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 155–157 | 12[73] |

### 1,6-Dimethyl-4-isopropylnaphthalene (Cadalene)



B. P., °C @ 760mm

| | |
|---|---|
| 287–291[43] | |
| 291–292 | 730[64] |
| 165 | 20[51] |
| 159.5–164 | 15[28] |
| 159–163 | 15[28] |
| 157 | 15[71] |
| 153–154 | 15[6] |
| 154–159 | 13[29] |
| 155–157 | 12[55] |
| 155–156 | 11[75] |
| 149 | 10[3] |

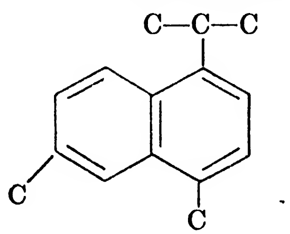
$D_4^{20}$

| | |
|---|---|
| 0.9731[55] | |
| 0.9716 | 25° [51] |
| 0.9781 | 19° [28] |
| 0.9790 | 19° [28] |
| 0.9798 | 19° [88] |
| 0.9824 | 15° [64] |

$n_D^{20}$

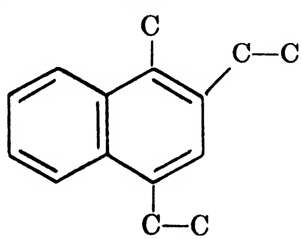
| | |
|---|---|
| 1.5820[43] | |
| 1.5834[71] | |
| 1.58491 | 25°[51] |
| 1.582 | 19°[75] |
| 1.5850 | 19°[28] |
| 1.5851 | 19°[28] |
| 1.5858 | 15°[88] |
| 1.5869 | 15°[64] |

## 1-Isopropyl-4,6-dimethylnaphthalene



M. P., °C
60[60]

## 1-Methyl-2,4-diethylnaphthalene



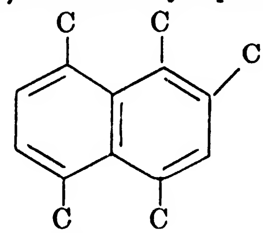
$D_4^{20}$

| | |
|---|---|
| 0.9870 | 13.3°[45] |

$n_D^{20}$

| | |
|---|---|
| 1.59231 | 13.3°[45] |
| 1.58549 | $n_{H\alpha}^{13.3}$ [45] |
| 1.61135 | $n_{H\beta}^{13.3}$ [45] |
| 1.62870 | $n_{H\gamma}^{13.3}$ [45] |

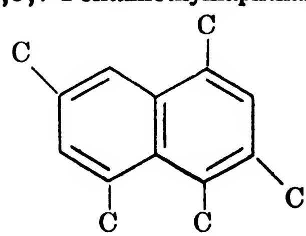
## 1,2,4,5,8-Pentamethylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 150 | 10[67] |

## 1,3,4,5,7-Pentamethylnaphthalene



M. P., °C
106–107[67]

B. P., °C @ 760mm

| | |
|---|---|
| 150 | 10[67] |

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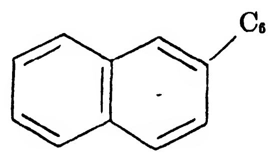
## $C_{16}H_{20}$

### 2-Hexylnaphthalene



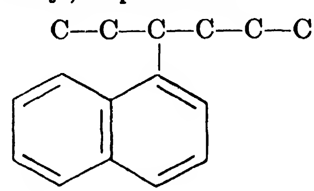
$D_4^{20}$

| | |
|---|---|
| 0.9575 | 25° [11] |

$n_D^{20}$

| | |
|---|---|
| 1.5673 | 25° [11] |

### 1-(3′-Hexyl)-naphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 148–158 | 1[18] |

### x-Methyl-x-isopentylnaphthalene (a)

B. P., °C @ 760mm

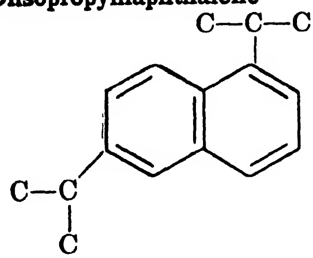
| | |
|---|---|
| 170–172 | 15[8] |

$D_4^{20}$

| | |
|---|---|
| 0.9607 | 21.5° [8] |

(a) The structure of this compound was not clearly defined in the literature.

**1,6-Diisopropylnaphthalene**



M. P., °C
52[10]

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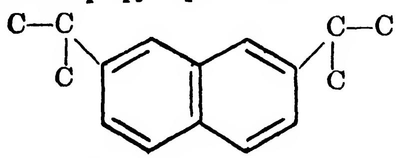
**2,7-Diisopropylnaphthalene**



B. P., °C @ 760mm
278–280[20]

$D_4^{20}$
0.9683[20]

$n_D^{20}$
1.5701[20]

---

**x,x-Diisopropylnaphthalene** (a)

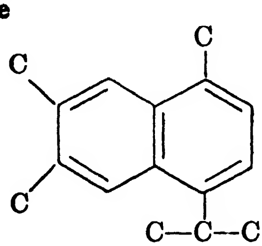
M. P., °C
38[10]

B. P., °C @ 760mm
317–319[10]

(a) The structure of this compound was not clearly defined in the literature.

---

**1,6,7-Trimethyl-4-isopropylnaphthalene**



M. P., °C
39.5–40.0[8]

## $C_{17}H_{22}$

**2-(x'-Naphthyl)-heptane** (a)

B. P., °C @ 760mm
162–165 6[19]

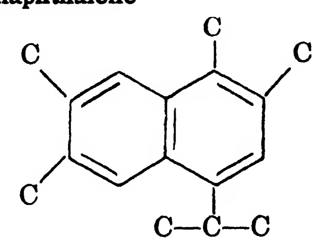
$D_4^{20}$
0.933 26.5° [19]

$n_D^{20}$
1.5448 24.4° [19]

(a) The structure of this compound was not clearly defined in the literature.

---

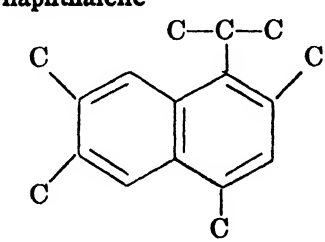
**1,2,6,7-Tetramethyl-4-isopropylnaphthalene**



M. P., °C
102–103[3]

---

**1-Isopropyl-2,4,6,7-tetramethylnaphthalene**



M. P., °C
96.5–97[3]

---

**x₄-Tetramethyl-x-isopropylnaphthalene** (a)

M. P., °C
111[5]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{18}H_{24}$

**x-*n*-Octylnaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 335–337 | 750[14] |

$D_4^{20}$

0.9366[14]

$n_D^{20}$

1.5510[14]

(a) The structure of this compound was not clearly defined in the literature.

---

**x,x-Di-*sec*-butylnaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 144–145 | 2[20] |
| 140–141 | 2[20] |

$D_4^{20}$

0.9529[20]
0.9547[20]

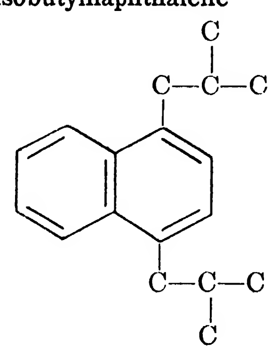
$n_D^{20}$

1.5596[20]
1.5601[20]

(a) The structure of this compound was not clearly defined in the literature.

---

**1,4-Diisobutylnaphthalene**



$D_4^{20}$

| | |
|---|---|
| 0.9310 | |
| 0.933[16] | |
| 0.8784 | 100° [4] |
| 0.9104 | 50° [4] |
| 0.9424 | 0° [9] |

$n_D^{20}$

| | |
|---|---|
| 1.5380 | 25° [16] |
| 1.5410 | 19° [9] |

Additional Data

$dD/dt = -0.0006561/°C$
(0 to 100°C)

---

**x,x-Di-*tert*-butylnaphthalene** (a)

M. P., °C

148 (b)[17]
146–147[1, 6]
145–146 (b)[7]
143[2]
142[10]
132[20]
82–83 (b)[7]
80–81 (b)[17]

B. P., °C @ 760mm

| | |
|---|---|
| 320 (b)[7] | |
| 319 (b)[7] | |
| 180–185 | 13[15] |

(a) The structure of this compound was not clearly defined in the literature.

(b) These constants were determined on isomeric forms.

---

## $C_{19}H_{26}$

**x,x,x-Triisopropylnaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 265–270[15] | |
| 148–152 | 2[20] |

$D_4^{20}$

| | |
|---|---|
| 0.9591[20] | |
| 0.946 | $D_{25}^{25}$ [15] |

$n_D^{20}$

1.5566[15]
1.5605[20]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{20}H_{28}$

### x,x-Di-*tert*-pentylnaphthalene (a)

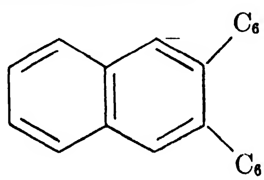
M. P., °C

154–155[20]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{22}H_{32}$

### 2,3-Dihexylnaphthalene



$n_D^{20}$

| | |
|---|---|
| 1.5434 | 25° [11] |

### $x_4$-Tetraisopropylnaphthalene (a)

M. P., °C

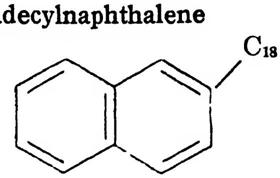
128[2]

127[10]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{28}H_{44}$

### 2-Octadecylnaphthalene



M. P., °C

51–52[11]

$D_4^{20}$

| | |
|---|---|
| 0.906 | 25° [11] |
| 0.912 | $D_{15.6}^{15.6}$ [13] |

$n_D^{20}$

| | |
|---|---|
| 1.5206 (a) | 25° [11] |

(a) This constant is an extrapolated value.

### x,x,x-Trihexylnaphthalene (a)

$D_4^{20}$

| | |
|---|---|
| 0.908 | 25° [11] |
| 0.911 | 25° [11] |
| 0.914 | $D_{15.6}^{15.6}$ [13] |
| 0.917 | $D_{15.6}^{15.6}$ [13] |

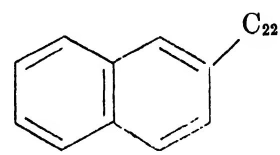
$n_D^{20}$

| | |
|---|---|
| 1.5276 | 25° [11] |
| 1.5297 | 25° [11] |

(a) The structure of this compound was not clearly defined in the literature.

## $C_{32}H_{52}$

### 2-Docosylnaphthalene



M. P., °C

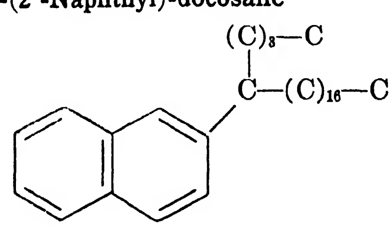
59.77[13]

56–58[11]

$D_4^{20}$

| | |
|---|---|
| 0.8987 | 25° [11] |
| 0.905 | $D_{15.6}^{15.6}$ [13] |

### 5-(2′-Naphthyl)-docosane



M. P., °C

38[12]

B. P., °C @ 760mm

| | |
|---|---|
| 200–201 | 2[12] |

$D_4^{20}$

| | |
|---|---|
| 0.898 (a) | 25° [11] |
| 0.904 | $D_{15.6}^{15.6}$ [13] |

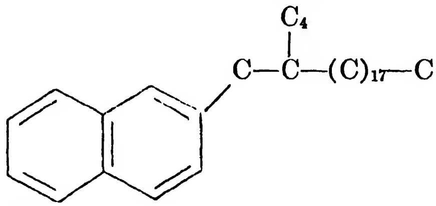
$n_D^{20}$

1.5170 25° [11]

(a) This constant is an extrapolated value.

## $C_{34}H_{56}$

### 1-(2′-Naphthyl)-2-butyleicosane



$D_4^{20}$

0.9011 25° [11]

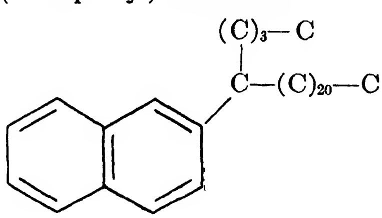
0.907 $D_{15.6}^{15.6}$ [13]

$n_D^{20}$

1.5163 25° [11]

## $C_{36}H_{60}$

### 5-(2′-Naphthyl)-hexacosane



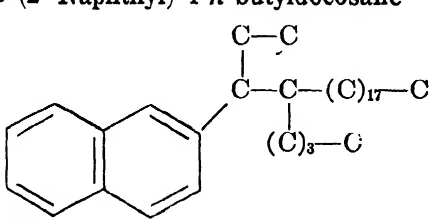
M. P., °C

39[13]

$D_4^{20}$

0.885 $D_{15.6}^{15.6}$ [13]

### 3-(2′-Naphthyl)-4-*n*-butyldocosane



$D_4^{20}$

0.8890 25° [11]

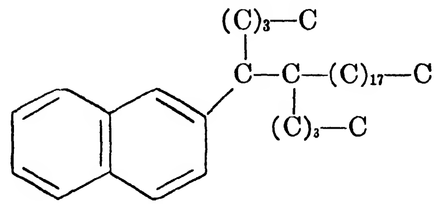
0.895 $D_{15.6}^{15.6}$ [13]

$n_D^{20}$

1.5090 25° [11]

## $C_{38}H_{64}$

### 5-(2′-Naphthyl)-6-*n*-butyltetracosane



$D_4^{20}$

0.8918 25° [11]

0.898 $D_{15.6}^{15.6}$ [13]

$n_D^{20}$

1.5093 25° [11]

*References on $C_{16}H_{20}$ through $C_{38}H_{64}$ Compounds*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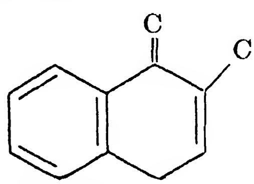
## 3. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-12}$

### $C_{12}H_{12}$

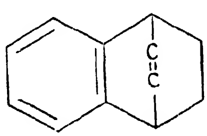
**1-Methylene-2-methyl-1,4-dihydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 157 | 15[17] |

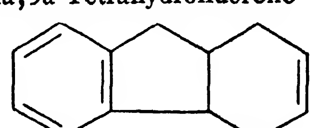
**1,4-Endoethene-1,2,3,4-tetrahydronaphthalene**



M. P., °C
63.5[32]

### $C_{13}H_{14}$

**1,4,4a,9a-Tetrahydrofluorene**



B. P., °C @ 760mm

| | |
|---|---|
| 121 | 12[49] |
| 116–118 | 11[2] |

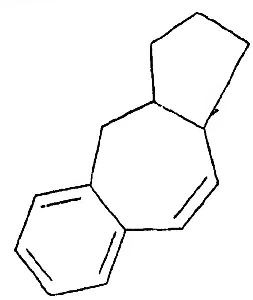
$D_4^{20}$

| | |
|---|---|
| 1.018 | 15° [49] |

$n_D^{20}$
1.58924[49]

### $C_{14}H_{16}$

**1,2-Cyclopentano-5,6-benzocycloheptene-3**

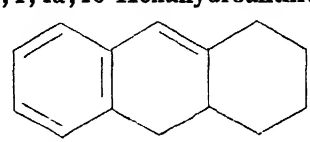


M. P., °C
29–35[16]

B. P., °C @ 760mm

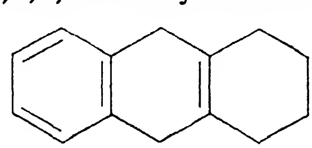
| | |
|---|---|
| 130–135 | 1[16] |

**1,2,3,4,4a,10-Hexahydroanthracene**



M. P., °C
63–66[16]

**1,2,3,4,9,10-Hexahydroanthracene**



M. P., °C

66.5[23, 24, 25, 46]
63[33]
62–63[36]
60–62[9]

B. P., °C @ 760mm

303–306[23, 24, 25]

---

**$x_6$-Hexahydroanthracene** (a)

M. P., °C

78[50]
70[54]
63[26]

B. P., °C @ 760mm

290[26]

(a) The structure of this compound was not clearly defined in the literature.

---

**$x_6$-Hexahydrophenanthrene** (a)

M. P., °C

−3[7]

B. P., °C @ 760mm

| | |
|---|---|
| 305–307[7, 8] | |
| 289–290 | 737[43] |
| 179–180 | 23[19] |
| 165–167 | 13[7] |
| 125–126 | 2.5[13] |

$D_4^{20}$

| | |
|---|---|
| 1.045[43] | |
| 1.043 | 15° [7] |
| 1.053 | 0° [7] |

$n_D^{20}$

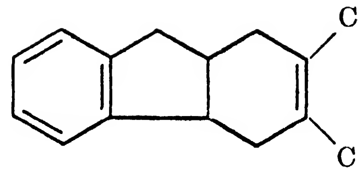
| | |
|---|---|
| 1.5704[43] | |
| 1.586 | 15° [7] |
| 1.5810 | 14.5° [13] |

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{15}H_{18}$

**2,3-Dimethyl-1,4,4a,9a-tetrahydrofluorene**

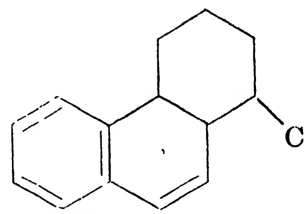


B. P., °C @ 760mm

146–148 11[2]

---

**1-Methyl-1,2,3,4,4a,10a-hexahydrophenanthrene**

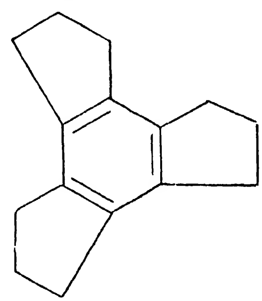


B. P., °C @ 760mm

124 0.3[27]

---

**4,5,6,7-Dicyclopentanoindane**

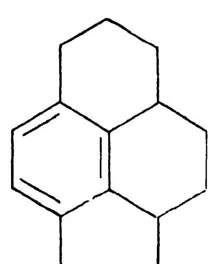


M. P., °C

97[41]

---

**Cyclopentano-[gh]-3a,4,5,6-tetrahydrophenalan**

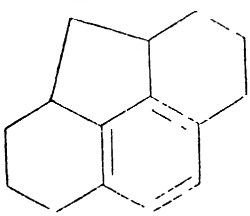


M. P., °C
29[58]

B. P., °C @ 760mm
130–132 12[58]

---

**Cyclopentano-[def]-1,2,3,4,5,6,7,8-octahydrophenanthrene**



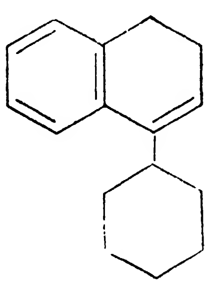
M. P., °C
47[58]

B. P., °C @ 760mm
238[58]
130-132 15[58]

---

## $C_{16}H_{20}$

**4-Cyclohexyl-1,2-dihydronaphthalene**

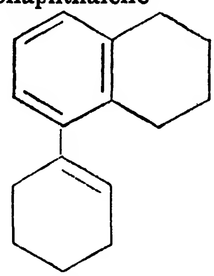


B. P., °C @ 760mm
172 10[14]
140 1[14]

$D_4^{20}$
1.021 12.2°[14]

$n_D^{20}$
1.5762 12.2°[14]

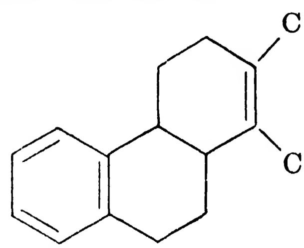
**5-(Cyclohexen-1′-yl)-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm
181 15[14]

---

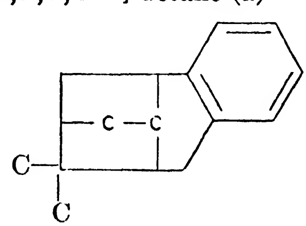
**1,2-Dimethyl-3,4,4a,9,10,10a-hexahydrophenanthrene**




B. P., °C @ 760mm
105–107 0.02[6]

---

**2,3-Benzo-6,6-dimethyltricyclo-[3,2,1,1$^{7,9}$]-decane (a)**

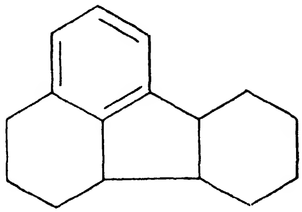



B. P., °C @ 760mm
121.5–122.5 5[3]
110.5–111 0.3[3]

$D_4^{20}$ 1.0192 $D_0^{16}$[3]
$n_D^{20}$ 1.5540 16°[3]

(a) The structure of this compound was not clearly defined in the literature.

**Benzo-[jk]-1,2,3,4,4a,4b,5,6,7,9a-decahydrofluorene**



B. P., °C @ 760mm

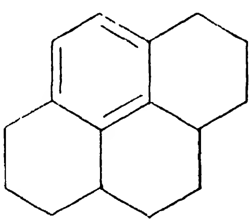
| | |
|---|---|
| 174–176 | 13[57] |
| 181–183 | 12[57] |

$D_4^{20}$

| | |
|---|---|
| 1.0207 | 29° [57] |
| 1.043 | 22° [57] |

---

**1,2,3,3a,4,5,5a,6,7,8-Decahydropyrene**



M. P., °C

34[58]

B. P., °C @ 760mm

| | |
|---|---|
| 160 | 5[35] |

$D_4^{20}$

| | |
|---|---|
| 1.0612[58] | |
| 1.0553 | 25° [35] |

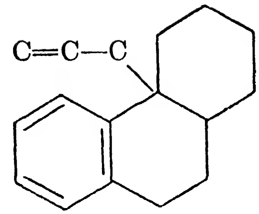
$n_D^{20}$

| | |
|---|---|
| 1.5806[58] | |
| 1.5782 | 25° [35] |

---

## $C_{17}H_{22}$

**4a-(Propen-2′-yl)-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**

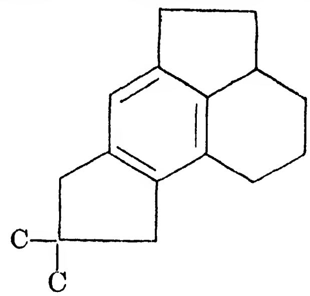



B. P., °C @ 760mm

| | |
|---|---|
| 118 | 0.2[28] |

---

**6,7-(4′,4′-Dimethylcyclopentano)-2a,3,4,5-tetrahydroacenaphthene**




B. P., °C @ 760mm

| | |
|---|---|
| 173–175 | 13[21] |

$D_4^{20}$

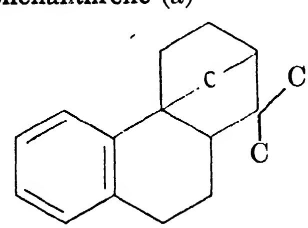
| | |
|---|---|
| 0.9884 | 22° [21] |

$n_D^{20}$

| | |
|---|---|
| 1.5399 | 22° [21] |

---

**1,1-Dimethyl-2,4a-endomethylene-1,2,3,4,4a,9,10,10a-octahydrophenanthrene (a)**




B. P., °C @ 760mm

| | |
|---|---|
| 132.5–133.5 | 1[3] |

$D_4^{20}$

| | |
|---|---|
| 1.0252 | $D_0^{19}$ [8] |

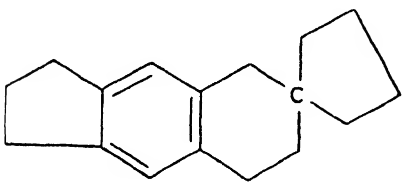
$n_D^{20}$

1.5578 19°[3]

(a) The structure of this compound was not clearly defined in the literature.

---

**Spiro[6,7-cyclopentano-1,2,3,4-tetrahydronaphthalene-2,1'-cyclopentane]**

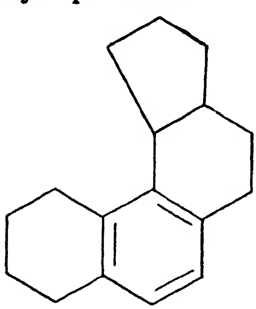


M. P., °C

64–65[48]

---

**3,4-Cyclopentano-1,2,3,4,5,6,7,8-octahydrophenanthrene**

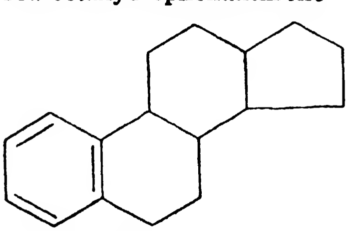


B. P., °C @ 760mm

172–173 5[37]

---

**1,2-Cyclopentano-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**

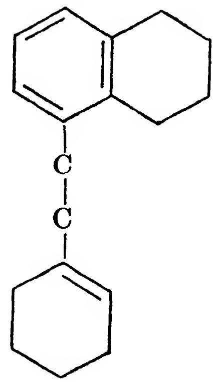


B. P., °C @ 760mm

201 16[30]

## $C_{18}H_{24}$

**5-[2'-(Cyclohexen-1''-yl)-ethyl]-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

140–150 0.05[10]

---

**1-Methyl-7-isopropyl-$x_6$-hexahydrophenanthrene** (a)

B. P., °C @ 760mm

355[38]

175–177 10[1, 53]

$D_4^{20}$

0.9802[1, 53]

0.997[38]

$n_D^{20}$

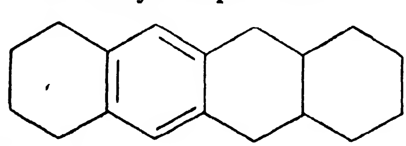
1.54705[1, 53]

1.54770[53]

(a) The structure of this compound was not clearly defined in the literature.

---

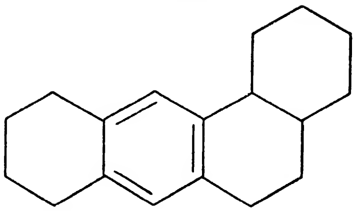
**1,2,3,4,4a,5,7,8,9,10,12,12a-Dodecahydronaphthacene**



M. P., °C

82–83[55]

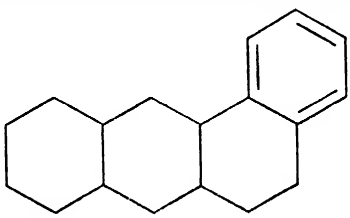
**1,2-Cyclohexano-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C
87–88[4]

---

**1,2-Benzododecahydroanthracene**



M. P., °C
87–88[11]
71–72[4, 12]
71[16]
68–70[15]

---

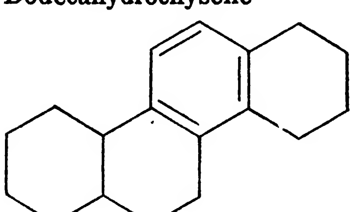
**Dodecahydro-x,x-benzoanthracene (a)**

$D_4^{20}$
1.123[31]

(a) The structure of this compound was not clearly defined in the literature.

---

**1,2,3,4,5,6,6a,7,8,9,10,10a-Dodecahydrochysene**



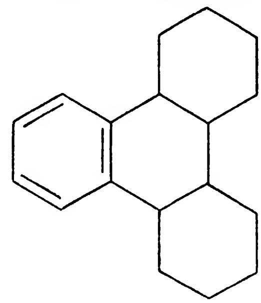
M. P., °C
93–94[39]
83–84[40]
55–57[56]

B. P., °C @ 760mm

| | |
|---|---|
| 224–226 | 12[56] |

---

**1,2,3,4,4a,4b,5,6,7,8,8a,12b-Dodecahydrotriphenylene**



B. P., °C @ 760mm

| | |
|---|---|
| 200–201.5 | 20[44] |

$D_4^{20}$

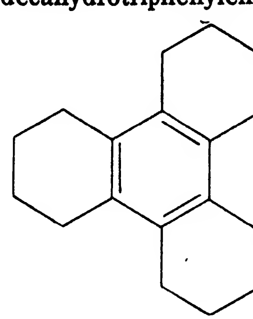
| | |
|---|---|
| 0.9468 | 19.2° [44] |

$n_D^{20}$

| | |
|---|---|
| 1.50432 | $n_{H\alpha}^{20}$ [44] |
| 1.51382 | $n_{H\beta}^{20}$ [44] |
| 1.5959 | $n_{H\gamma}^{20}$ [44] |
| 1.50693 | $n_{He}^{20}$ [44] |

---

**1,2,3,4,5,6,7,8,9,10,11,12-Dodecahydrotriphenylene**



M. P., °C
232
232–233[18, 34, 45, 59]
232[5]
231–232[59]

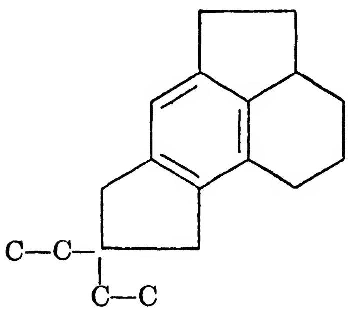
226–228[52]
226[51]

$D_4^{20}$

| | |
|---|---|
| 1.141 | 0° [60] |
| 1.148 | 0° [60] |

## $C_{19}H_{26}$

**6,7-(4′,4′-Diethylcyclopentano)-2a,3,4,5-tetrahydroacenaphthene**



B. P., °C @ 760mm

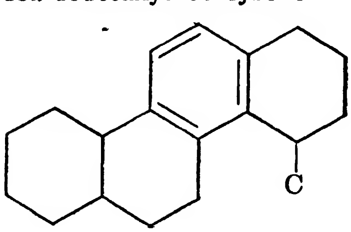
| | |
|---|---|
| 190–195 | 16[21, 22] |

**4-Methyldodecahydro-1,2-benzoanthracene** (a)

M. P., °C
92.5–93.5[17]

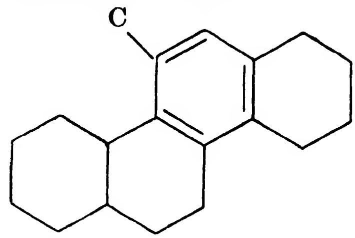
(a) The structure of this compound was not clearly defined in the literature.

**4-Methyl-1,2,3,4,5,6,6a,7,8,9,10,10a-dodecahydrochrysene**



M. P., °C
87–87.5[40]

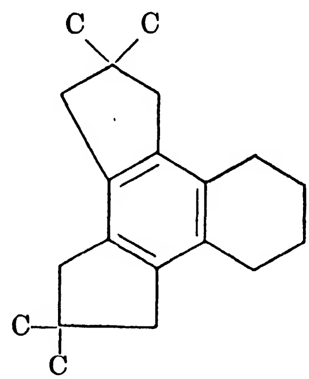
**11-Methyl-1,2,3,4,5,6,6a,7,8,9,10a-dodecahydrochrysene**



M. P., °C
98.8–99.8[20]

## $C_{20}H_{28}$

**5,6,7,8-Di-(4′,4′-dimethylcyclopentano)-1,2,3,4-tetrahydronaphthalene**



M. P., °C
105–106[21, 22]

## $C_{22}H_{32}$

**x,x-Dicyclohexyl-1,2,3,4-tetrahydronaphthalene** (a)

M. P., °C
−4[42]

B. P., °C @ 760mm

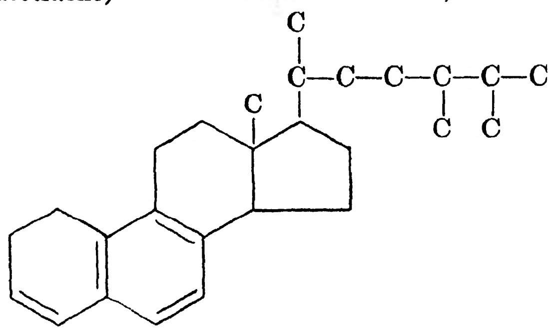
| | | |
|---|---|---|
| | 198–203 | 3[42] |
| $D_4^{20}$ | 0.9978 | 40° [42] |
| | 1.0145 | $D_{15}^{15}$ [42] |
| $n_D^{20}$ | 1.5618[42] | |
| | 1.5548 | 40° [42] |

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{26}H_{40}$

**1,2-[3′-(5″,6″-Dimethyl-*sec*-heptyl)-cyclopentano]-2-methyl-1,2,3,4,5,6-hexahydrophenanthrene**
(Neoergostatetraene)



M. P., °C
63–64[29]

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*References on Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-12}$*


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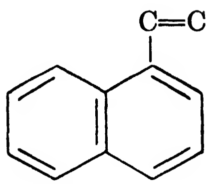
## IV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-14}$

1. Naphthalene Derivatives of Empirical Formula $C_nH_{2n-14}$
2. Cyclanonaphthalenes and Their Alkyl Derivatives
3. Tetrahydroanthracenes, Tetrahydrophenanthrenes, and Their Alkyl Derivatives
4. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-14}$

# 1. NAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-14}$

## $C_{12}H_{10}$

### 1-Ethenylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 126–128 | 15[16] |
| 124–125 | 15[32] |
| 116–117 | 8[29] |
| 105–106 | 6[34] |
| 103–104 | 4[34] |
| 115–116 | 3–4[32] |

$D_4^{20}$

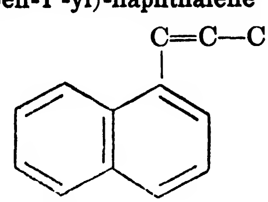
| | |
|---|---|
| 1.034[20] | |
| 1.0656[34] | |
| 1.0439 | $D_{24}^{24}$ [29] |
| 1.0361 | 18° [32] |
| 1.0774 | 0° [34] |

$n_D^{20}$

| | |
|---|---|
| 1.6388[34] | |
| 1.6436[20, 32] | |
| 1.6425 | 24° [29] |

## $C_{13}H_{12}$

### 1-(Propen-1′-yl)-naphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 275–278[33] | |
| 147–149 | 15[33] |
| 135–136 | 12[22] |
| 137–138 | 10[26] |
| 112–113 | 6[34] |

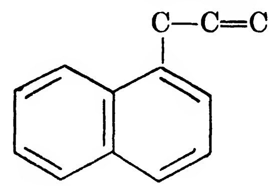
$D_4^{20}$

| | |
|---|---|
| 1.0282[34] | |
| 1.0429 | 0° [34] |

$n_D^{20}$

1.6335[34]

### 1-(Propen-2′-yl)-naphthalene



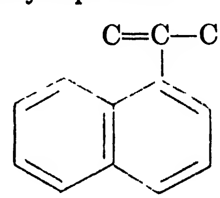
B. P., °C @ 760mm

| | |
|---|---|
| 265–267[33] | |
| 130–131 | 12[22] |
| 127.5–128.5 | 8[9] |

$n_D^{20}$

| | |
|---|---|
| 1.6089 | 25° [9] |

### 1-Isopropenylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 256–257[14] | |
| 251–251.5 | 744[30] |
| 130–132 | 15[13] |
| 123–125 | 10–11[5] |
| 125 | 8[3, 10, 11, 12] |
| 112–113 | 6[34] |
| 107–109 | 4[34] |
| 97 | 0.1[28] |

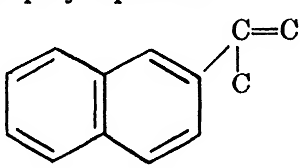
$D_4^{20}$

| | |
|---|---|
| 1.0273[34] | |
| 1.0078 | 25°[30] |
| 1.0143 | 9°[10, 11] |
| 1.0208 | 0°[10, 11] |

$n_D^{20}$

| | |
|---|---|
| 1.6142[34] | |
| 1.6070 | 25°[28] |
| 1.6068 | 25°[30] |
| 1.6040 | 16°[13] |
| 1.61435 | 9°[10, 11] |

**2-Isopropenylnaphthalene**



M. P., °C

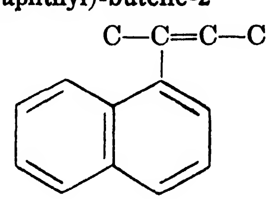
56[2]
46–47[10, 11]
45–47[12]

B. P., °C @ 760mm

| | |
|---|---|
| 126–127 | 12[27] |
| 155 | 11[2] |
| 138–140 | 7[12] |

## $C_{14}H_{14}$

**2-(1′-Naphthyl)-butene-2**



B. P., °C @ 760mm

| | |
|---|---|
| 113.5–115 | 5[34] |

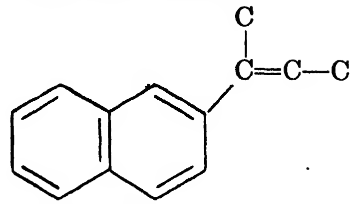
$D_4^{20}$

1.0533[34]

$n_D^{20}$

1.6137[34]

**2-(2′-Naphthyl)-butene-2**

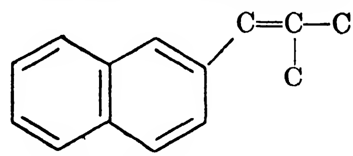


B. P., °C @ 760mm

| | |
|---|---|
| 108–112 | 0.15[2] |

$n_D^{20}$ 1.6202[2]

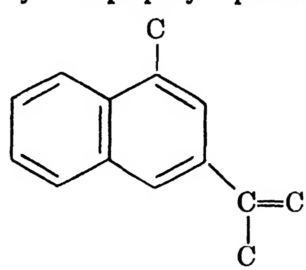
**1-(2′-Naphthyl)-2-methylpropene-1**



B. P., °C @ 760mm

287–288[15]

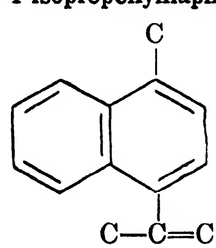
**1-Methyl-3-isopropenylnaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 154 | 12[7] |

**1-Methyl-4-isopropenylnaphthalene**

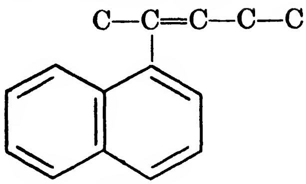


B. P., °C @ 760mm

| | |
|---|---|
| 140 | 16[8] |

## $C_{15}H_{16}$

### 2-(1′-Naphthyl)-pentene-2



B. P., °C @ 760mm

| | |
|---|---|
| 158–160 | 20[31] |

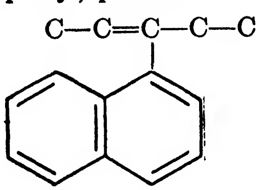
$D_4^{20}$

| | |
|---|---|
| 1.0094 | 22° [31] |

$n_D^{20}$

| | |
|---|---|
| 1.59206 | 22° [31] |

### 3-(1′-Naphthyl)-pentene-2



B. P., °C @ 760mm

| | |
|---|---|
| 119–120 | 6[34] |

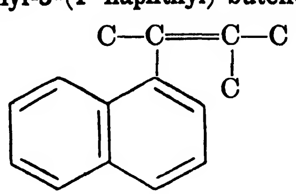
$D_4^{20}$

1.034[34]

$n_D^{20}$

1.597[34]

### 2-Methyl-3-(1′-naphthyl)-butene-2



B. P., °C @ 760mm

| | |
|---|---|
| 165–166 | 23[31] |

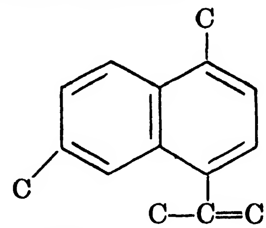
$D_4^{20}$

| | |
|---|---|
| 1.0039 | 19° [31] |

$n_D^{20}$

| | |
|---|---|
| 1.59343 | 19° [31] |

### 1,6-Dimethyl-4-isopropenylnaphthalene
(Dehydrocadalene)



B. P., °C @ 760mm

| | |
|---|---|
| 154 | 14[1] |
| 155–157 | 12[21] |

$D_4^{20}$

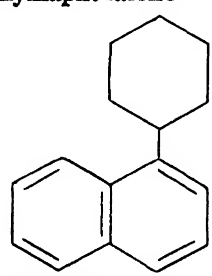
0.9731[21]

$n_D^{20}$

1.5572[21]

## $C_{16}H_{18}$

### 1-Cyclohexylnaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 118–120 | 0.3[6] |

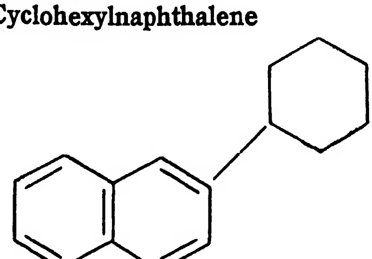
$D_4^{20}$

| | |
|---|---|
| 1.044 | 15° [6] |

$n_D^{20}$

| | |
|---|---|
| 1.6099 | 17° [6] |
| 1.6000 | 11° [6] |

### 2-Cyclohexylnaphthalene



M. P., °C

31[4, 6, 24]

B. P., °C @ 760mm

| | |
|---|---|
| 190–195 | 15[25] |

$D_4^{20}$

| | |
|---|---|
| 1.0074 | 40° [24] |
| 1.0049 | $D_{15}^{40}$ [24] |
| 1.020 | $D_{25}^{25}$ [25] |

$n_D^{20}$

| | |
|---|---|
| 1.5973[25] | |
| 1.5925 | 40° [24] |

---

**1-Methyl-x-cyclopentylnaphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 156–158 | 1[23] |

$D_4^{20}$

| | |
|---|---|
| 1.0353[23] | |
| 1.0419 | $D_{15}^{15}$ [23] |

$n_D^{20}$

1.6088[23]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{17}H_{20}$

**2-(2′-Naphthyl)-5-methylhexene-x** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 175–178 | 10[10, 12] |

$D_4^{20}$

| | |
|---|---|
| 0.9728 | 9° [10] |
| 0.9808 | 0° [10, 12] |

$n_D^{20}$

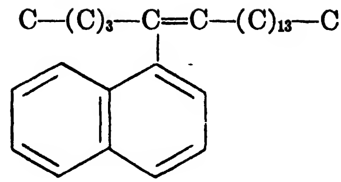
| | |
|---|---|
| 1.59124 | 9° [10, 12] |

(a) The double bond may be in either the 1- or 2-position.

---

## $C_{30}H_{46}$

**5-(1′-Naphthyl)-eicosene-5**



$D_4^{20}$

0.9107[17]

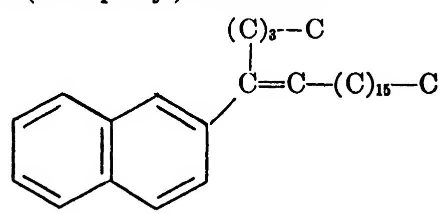
$n_D^{20}$

| | |
|---|---|
| 1.53019[17] | |
| 1.52536 | $n_{H\alpha}^{20}$ [17] |
| 1.54290 | $n_{H\beta}^{20}$ [17] |

---

## $C_{32}H_{50}$

**5-(2′-Naphthyl)-docosene-5**



$D_4^{20}$

| | |
|---|---|
| 0.9081 | 25° [18] |
| 0.915 | $D_{15.6}^{15.6}$ [19] |

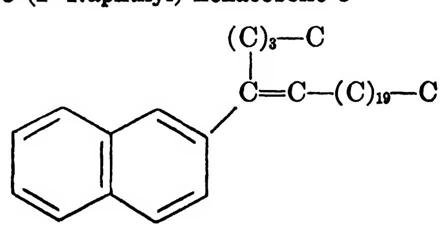
$n_D^{20}$

| | |
|---|---|
| 1.5300 | 25° [18] |

---

## $C_{36}H_{58}$

**5-(2′-Naphthyl)-hexacosene-5**



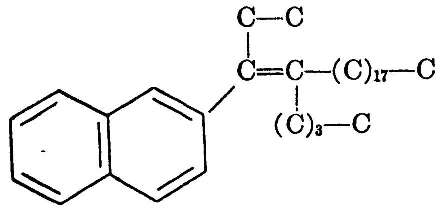
$D_4^{20}$

| | |
|---|---|
| 0.8830 | 25° [18] |
| 0.889 | $D_{15.6}^{15.6}$ [19] |

$n_D^{20}$

| | |
|---|---|
| 1.5128 | 25° [18] |

## 3-(2′-Naphthyl)-4-*n*-butyldocosene-3



$D_4^{20}$

| | |
|---|---|
| 0.8960 | 25° [18] |
| 0.902 | $D_{15.6}^{15.6}$ [19] |

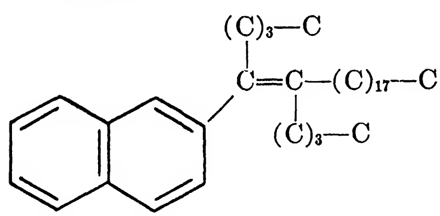
$n_D^{20}$

| | |
|---|---|
| 1.5170 | 25° [18] |

---

### $C_{38}H_{62}$

## 5-(2′-Naphthyl)-6-*n*-butyltetracosene-5



| | | |
|---|---|---|
| $D_4^{20}$ | 0.8896 | 25° [18] |
| | 0.895 | $D_{15.6}^{15.6}$ [19] |
| $n_D^{20}$ | 1.5161 | 25° [18] |

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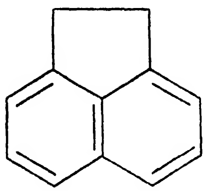
## 2. CYCLANONAPHTHALENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-14}$

### $C_{12}H_{10}$

**Acenaphthene**



M. P., °C

**95 .4**
100[30, 80]
99–100[29]
99[37, 72]
96.5[46]
96.2[19, 20, 21]
94–96[2, 31]
95.5[18]
95.0[39, 65]
95(a)
94.1[55]
94.0[38]
94[28]
93–94[34]
93.5[51, 61, 78]
93.3[54, 77]
93[4, 5, 6]
92–93[58, 59]
92.5[27]
92.1[16]

B. P., °C @ 760mm

**277 .3**
279[30, 62, 83]
278[84]
277.9[44]
277.5[1, 3, 41, 68]
277.3[55]

| | |
|---|---|
| 287.8 | 943.0[55] |
| 287.0 | 932.3[55] |
| 286.8 | 930.3[55] |
| 275.4 | 733.4[55] |
| 275.3 | 733.4[55] |
| 264.4 | 573.5[55] |
| 264.4 | 573.1[55] |
| 252.5 | 434.7[55] |
| 252.4 | 434.5[55] |
| 247.0 | 382.9[55] |
| 246.6 | 377.9[55] |
| 246.2 | 374.6[55] |
| 233.2 | 272.0[55] |
| 229.5 | 250[64] |
| 227.2 | 234.6[55] |
| 210.4 | 149.0[55] |
| 210.2 | 148.0[55] |
| 182.4 | 63.6[55] |
| 147 | 20[48] |
| 147.2 | 19.2[55] |
| 144 | 12[62] |
| 20.0 | <.02[45] |

$D_4^{20}$

1.220 (solid) (b)[56]

| | |
|---|---|
| 0.962 | 178.7° [18] |
| 1.003 | 128.6° [18] |
| 1.0300 | 103° [73] |
| 1.0685 | $D_{100}^{100}$ [64] |
| 1.0242 | 99.2° [81] |
| 1.0331 | 98.8° [15] |
| 1.0687 | $D_{95}^{95}$ [64] |
| 1.2195 | 24.8° [32] |

$n_D^{20}$

| | |
|---|---|
| 1.60658 | 99.2° [81] |
| 1.60482 | 98.8° [15] |
| 1.59877 | $n_{H\alpha}^{99.2}$ [81] |
| 1.59772 | $n_{H\alpha}^{98.8}$ [15] |

| | |
|---|---|
| 1.62838 | $n_{H\beta}^{99.2}$ [81] |
| 1.62705 | $n_{H\beta}^{98.8}$ [15] |

Additional Data

Crit. Temp. (°C)

530.0[82]

$$\frac{1}{T_b} = 0.0028359\text{-}0.0003538 \log_{10} p_{mm}$$

(60 to 945mm)

(a) The melting point 95 is found in references 1, 3, 7, 15, 24, 33, 35, 47, 52, 53, 57, 60, 62, 63, 67, 68, 69, 74, 79, 81, 83, 84.

(b) The temperature of this determination was not given.

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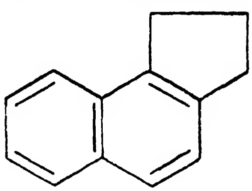
## $C_{13}H_{12}$

### 1,2-Cyclopentanonaphthalene



B. P., °C @ 760mm

| | |
|---|---|
| 296–296.6 | 757.5[17] |
| 294–295 | 757[40] |
| 170 | 15[14] |
| 118 | 0.5[36] |

$D_4^{20}$

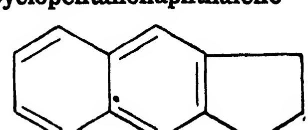
| | |
|---|---|
| 1.066[40] | |
| 1.0569 | 19.6° [36] |
| 1.0671 | 17.5° [17] |

$n_D^{20}$

| | |
|---|---|
| 1.6290[40] | |
| 1.6323 | 19.7° [14] |
| 1.62649 | 19.6° [36] |
| 1.6325 | 17.5° [17] |

---

### 2,3-Cyclopentanonaphthalene



M. P., °C

94[75, 76]

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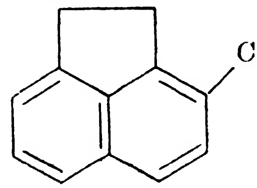
### 3-Methylacenaphthene



M. P., °C

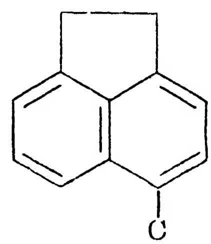
57[11]

B. P., °C @ 760mm

| | |
|---|---|
| 130–135 | 3[11] |

---

### 5-Methylacenaphthene



M. P., °C

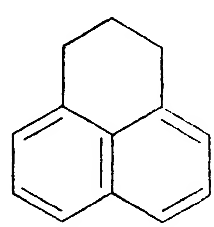
88[11]

B. P., °C @ 760mm

| | |
|---|---|
| 125 | 12[11] |

---

### Phenalan



M. P., °C

65.4

68–69[42]

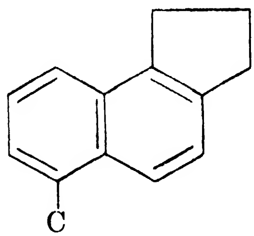
66–67[25]

65.1–65.4[22]

65[12]

## $C_{14}H_{14}$

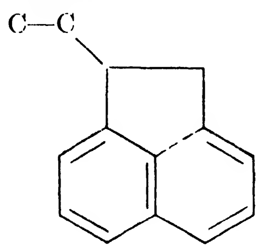
### 1,2-Cyclopentano-5-methylnaphthalene



M. P., °C
44[50]

---

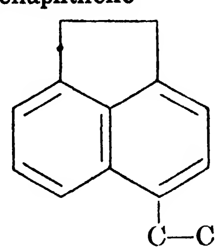
### 1-Ethylacenaphthene



M. P., °C
34.8–35.1[23]
30[13]

---

### 5-Ethylacenaphthene



M. P., °C
42.5–43.0[70]
42.5–43[26]

B. P., °C @ 760mm
310[18]

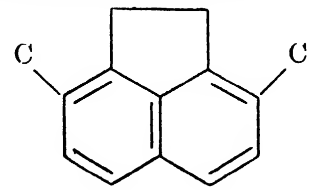
| | |
|---|---|
| 166 | 20[48] |
| 160 | 20[70] |
| 158 | 13[26] |

$D_4^{20}$
1.0407[26]

$n_D^{20}$
1.6117[26]

---

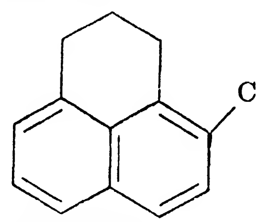
### 3,8-Dimethylacenaphthene



M. P., °C
68[11]

---

### 4-Methylphenalan



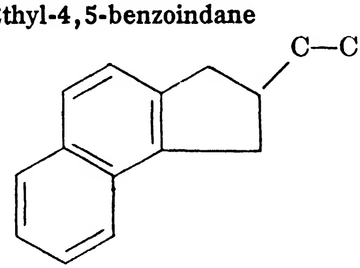
B. P., °C @ 760mm

| | |
|---|---|
| 160–170 | 7[9] |

---

## $C_{15}H_{16}$

### 2-Ethyl-4,5-benzoindane



B. P., °C @ 760mm

| | |
|---|---|
| 157–160 | 14[49] |

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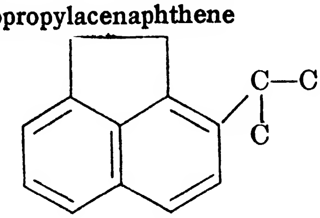
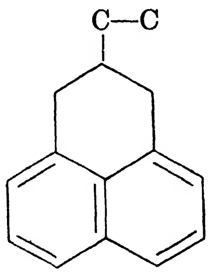
### 3-Isopropylacenaphthene



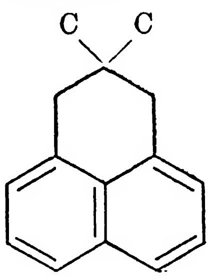
B. P., °C @ 760mm
145–150 0.8[11]

**2-Ethylphenalan**



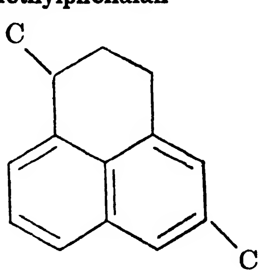
B. P., °C @ 760mm
167–168 16[49]

**2,2-Dimethylphenalan**



B. P., °C @ 760mm
168–170 17[8]

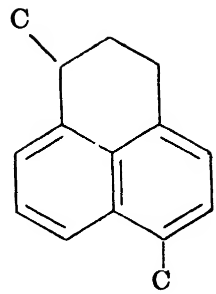
**1,5-Dimethylphenalan**



M. P., °C
43–44[10]

B. P., °C @ 760mm
150–160 1.2[10]

**1,6-Dimethylphenalan**

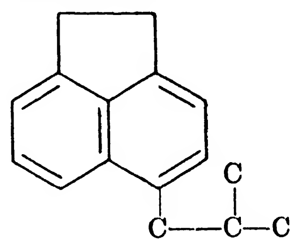


M. P., °C
75[10]

B. P., °C @ 760mm
150 0.8[10]

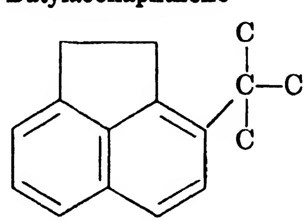
## $C_{16}H_{18}$

**5-Isobutylacenaphthene**



B. P., °C @ 760mm
138–139 0.5[43]

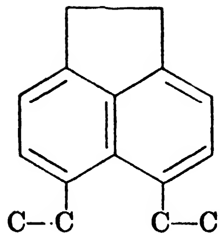
**3-*tert*-Butylacenaphthene**



M. P., °C
73–74[66]

B. P., °C @ 760mm
170–174 7[66]
155–160 0.8[11]

**5,6-Diethylacenaphthene**



M. P., °C

10–11[26, 70]

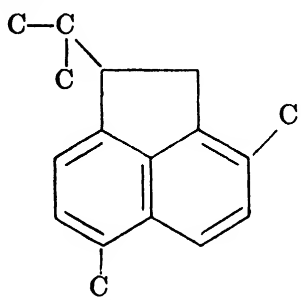
B. P., °C @ 760mm

182 14[26, 70]

---

## $C_{17}H_{20}$

**1-Isopropyl-3,6-dimethylacenaphthene**



B. P., °C @ 760mm

125 0.05[71]

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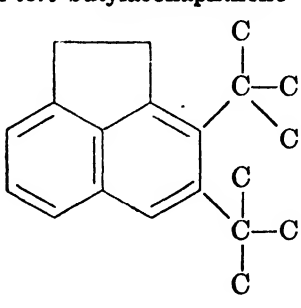
## $C_{20}H_{26}$

**3,4-Di-*tert*-butylacenaphthene**



M. P., °C

162–163[66]

B. P., °C @ 760mm

358–360 758[66]

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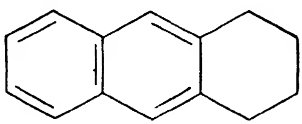
## 3. TETRAHYDROANTHRACENES, TETRAHYDROPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-14}$

### $C_{14}H_{14}$

**1,2,3,4-Tetrahydroanthracene**
(Tethracene)



M. P., °C

**103.5**
106–107[30]
104–105[21]
103–105[17, 28]
104[33]
103–104[18]
103[7, 16]
100.5–101.5[23]
101[10, 12]

B. P., °C @ 760mm

| | |
|---|---|
| 170–173 | 14[18] |

---

**x,x,9,10-Tetrahydroanthracene** (a)

M. P., °C

89[8, 9, 11, 28]
74[33]

B. P., °C @ 760mm

309–313[8, 9, 11]

(a) The structure of this compound was not clearly defined in the literature.

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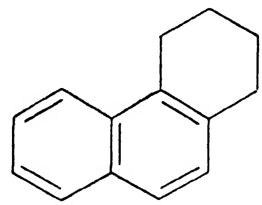
**1,2,3,4-Tetrahydrophenanthrene**
(Tetanthrene)



M. P., °C

**33.5**
34–35[6]
33–34[20, 29, 31]
32.5–33.5[1]
33[24]

B. P., °C @ 760mm

| | |
|---|---|
| 173 | 11[31] |
| 170–171 | 10[6] |

$D_4^{20}$

| | |
|---|---|
| 1.0601 | 40° [31] |

---

**$x_4$-Tetrahydrophenanthrene** (a)

M. P., °C

70[3]
14[35]
−4–−3[27]
−5–−4[27]

B. P., °C @ 760mm

| | |
|---|---|
| 310[4, 13, 14, 19] | |
| 302–302.5[25] | |
| 302[14] | |
| 306–308 | 737[27] |
| 307 | 737[27] |
| 302–303 | 737[27] |
| 300–304 | 723[2] |
| 147 | 18[25] |
| 145–149 | 9[26] |

$D_4^{20}$

| | |
|---|---|
| 1.080[27] | |
| 1.085[27] | |
| 1.0707 | 24.0°[35] |
| 1.02887 | 16.8°[25] |
| 1.02934 | 12.3°[25] |
| 1.067 | 10.2°[13] |

$n_D^{20}$

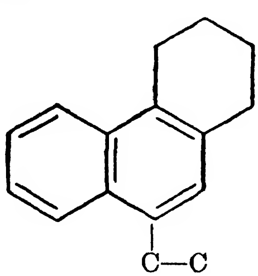
| | |
|---|---|
| 1.5820[27] | |
| 1.57909 | 16.8°[25] |
| 1.58112 | 12.3°[25] |
| 1.61880 | $n_{H\alpha}^{24.0}$ [35] |
| 1.57373 | $n_{H\alpha}^{16.8}$ [25] |
| 1.57560 | $n_{H\alpha}^{12.3}$ [25] |
| 1.64684 | $n_{H\beta}^{24.0}$ [35] |
| 1.59369 | $n_{H\beta}^{16.8}$ [25] |
| 1.59550 | $n_{H\beta}^{12.3}$ [25] |
| 1.62660 | $n_{He}^{24.0}$ [35] |

(a) The structure of this compound was not clearly defined in the literature. The data probably represent more than one compound.

---

## $C_{16}H_{18}$

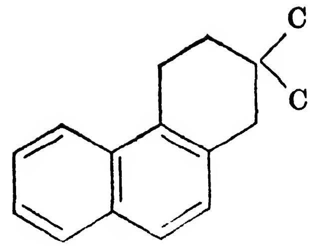
**9-Ethyl-1,2,3,4-tetrahydrophenanthrene**



M. P., °C
23–25[1]

---

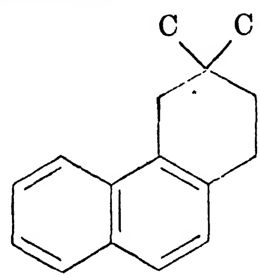
**2,2-Dimethyl-1,2,3,4-tetrahydrophenanthrene**



B. P., °C @ 760mm
161–163 6[32]

---

**3,3-Dimethyl-1,2,3,4-tetrahydrophenanthrene**

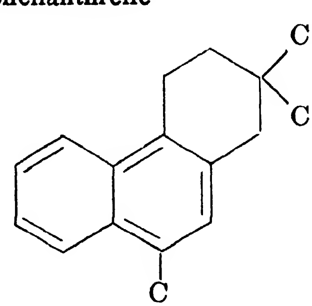


B. P., °C @ 760mm
155–157 7[32]

---

## $C_{17}H_{20}$

**2,2,9-Trimethyl-1,2,3,4-tetrahydrophenanthrene**

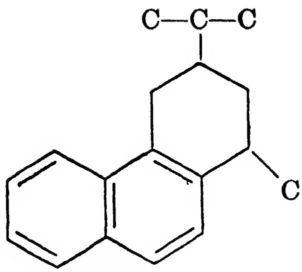


M. P., °C
90–91[32]

---

## $C_{18}H_{22}$

**1-Methyl-3-isopropyl-1,2,3,4-tetrahydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 208 | 23[5] |

---

**1-Methyl-7-isopropyl-x$_4$-tetrahydrophenanthrene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 360–366[22] | |
| 280 | 50[2] |
| 180–183 | 10[34] |

$D_4^{20}$

1.0057[34]
1.011[22]

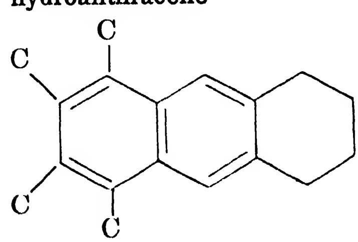
$n_D^{20}$

1.56061[34]

(a) The structure of this compound was not clearly defined in the literature.

---

**5,6,7,8-Tetramethyl-1,2,3,4-tetrahydroanthracene**



M. P., °C

127.5–128[15]

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## 4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-14}$

### $C_{13}H_{12}$

**x,x-Dihydrofluorene** (a)

M. P., °C
109[5, 7, 8]

B. P., °C @ 760mm
251–254[5, 7, 8]

(a) The structure of this compound was not clearly defined in the literature.

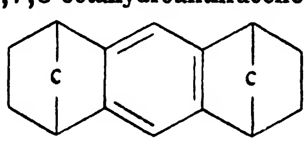
### $C_{16}H_{18}$

**$x_8$-Octahydrofluoranthene** (a)
(Octahydroidryl)

B. P., °C @ 760mm
309–311[3]

(a) The structure of this compound was not clearly defined in the literature.

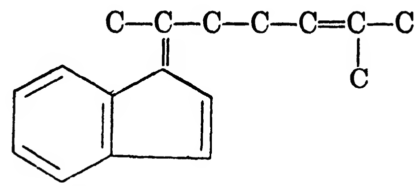
**1,4,5,8-Diendomethylene-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C
157[2]

### $C_{17}H_{20}$

**2-(1′-Indenylidene)-6-methylheptene-5**

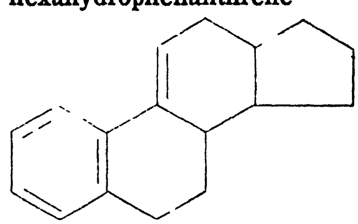


B. P., °C @ 760mm
130 0.2[9]

$D_4^{20}$
0.9680 24° [9]

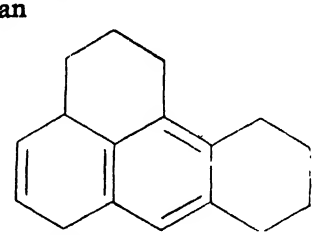
$n_D^{20}$
1.5942 24° [9]

**1,2-Cyclopentano-1,2,3,9,10,10a-hexahydrophenanthrene**



B. P., °C @ 760mm
164–165 3[4]

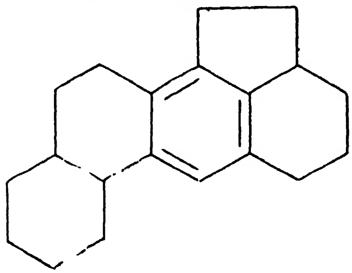
**4,5-Cyclohexano-7,9a-dihydrophenalan**



B. P., °C @ 760mm
213–214 13[10]

## $C_{20}H_{26}$

**2a,3,4,5,6b,7,8,9,10,10a,11,12-Dodecahydrocholanthrene**



M. P., °C
62–63[1]

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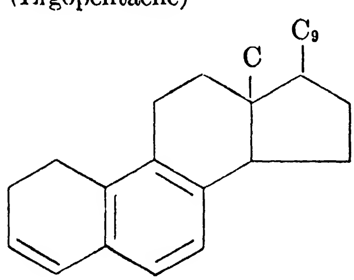
## $C_{27}H_{40}$

**1,2-(3′-Nonylcyclopentano)-2-methyl-1,2,3,4,5,6-hexahydrophenanthrene**
(Ergopentaene)




M. P., °C
89–90[11]

Additional Data
$[\alpha]_D^{19} = +69.5°$ [11]
$[\alpha]_D^{19} = +66.7°$ [11]

## $C_{34}H_{54}$

**Tolylcholestane** (a)

M. P., °C
202 (b)[6]
120 (b)[6]

(a) The structure of this compound was not clearly defined in the literature.

(b) These constants were determined on isomeric forms.

---

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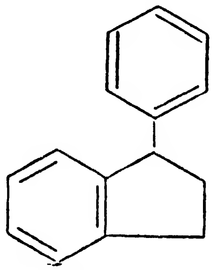
## V. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-16}$

1. Indane with One Phenyl Substitution
2. Naphthalene Derivatives of Empirical Formula $C_nH_{2n-16}$
3. Tetrahydronaphthalene with One Phenyl Substitution
4. Biphenylene, Fluorene, and Their Alkyl Derivatives
5. Dihydroanthracenes, Dihydrophenanthrenes, and Their Alkyl Derivatives
6. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-16}$

## 1. INDANE WITH ONE PHENYL SUBSTITUTION, $C_nH_{2n-16}$

### $C_{15}H_{14}$

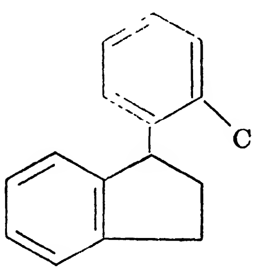
**1-Phenylindane**



B. P., °C @ 760mm
148–150 13[4]

### $C_{16}H_{16}$

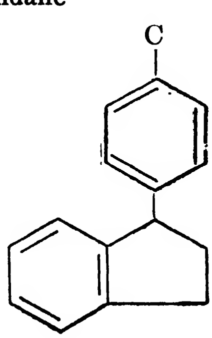
**1-*o*-Tolylindane**




M. P., °C
57[9]

B. P., °C @ 760mm
160–162 14[9]

**1-*p*-Tolylindane**

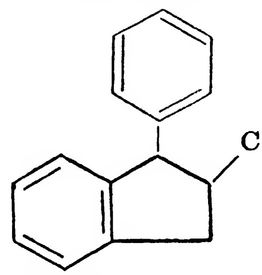



B. P., °C @ 760mm
168–170 14[9]

$D_4^{20}$
1.0455[9]

$n_D^{20}$
1.5878[9]

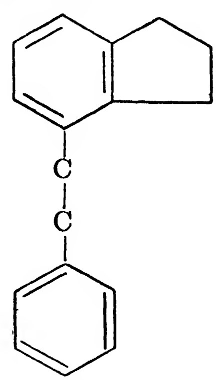
**1-Phenyl-2-methylindane**




B. P., °C @ 760mm
181 10[3]

### $C_{17}H_{18}$

**4-Phenethylindane**



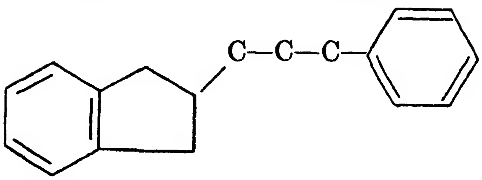

B. P., °C @ 760mm
115–120 0.0001[5]

$D_4^{20}$
1.020 25° [5]

$n_D^{20}$
1.5640 29° [5]

## $C_{18}H_{20}$

### 1-Phenyl-3-(2′-indanyl)-propane (a)



B. P., °C @ 760mm

| | |
|---|---|
| 197 | 13[8] |

$D_4^{20}$

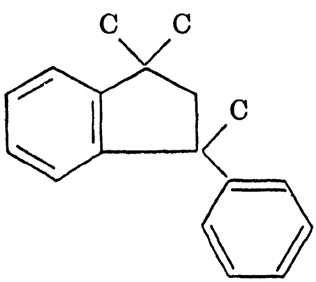
| | |
|---|---|
| 1.0128 | 18° [8] |

$n_D^{20}$

| | |
|---|---|
| 1.5667 | 18° [8] |

(a) This compound was given as 2γ-phenylpropylhydrindene in the literature, but no structural formula was given.

### 1,1,3-Trimethyl-3-phenylindane



M. P., °C
53[2]
52[10]

B. P., °C @ 760mm

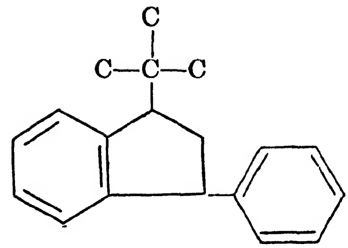
| | |
|---|---|
| 307–310[6] | |
| 166–167 | 25[2] |
| 165–166 | 24[2] |
| 155 | 12[2] |

$D_4^{20}$
1.0009[6]

$n_D^{20}$
1.56809[6]

## $C_{19}H_{22}$

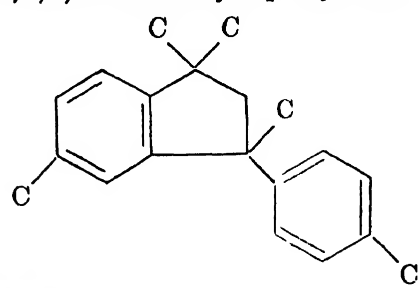
### 1-*tert*-Butyl-3-phenylindane



M. P., °C
181–182[1]

## $C_{20}H_{24}$

### 1,1,3,5-Tetramethyl-3-*p*-tolylindane



M. P., °C
37.5–38.5[7]

B. P., °C @ 760mm

| | |
|---|---|
| 328.5–329 | 759[7] |

*References on Indane with One Phenyl Substitution*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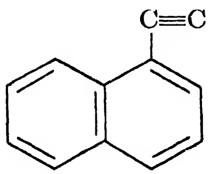
## 2. NAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-16}$

### $C_{12}H_8$

**1-Ethynylnaphthalene**



B. P., °C @ 760mm

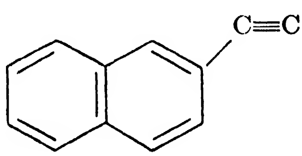
| | |
|---|---|
| 143-44 | 25[16, 17] |

$D_4^{20}$

1.057[17]

---

**2-Ethynylnaphthalene**



M. P., °C

36[16, 22]

B. P., °C @ 760mm

| | |
|---|---|
| 104–107 | 2[22] |
| 104–107 | 1[22] |

---

### $C_{13}H_{10}$

**1-(Propyn-x′-yl)-naphthalene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 154 | 15[4] |

$D_4^{20}$

| | |
|---|---|
| 1.056 | 13° [4] |
| 1.066 | 0° [4] |

$n_D^{20}$

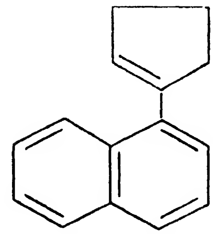
| | |
|---|---|
| 1.630 | 13° [4] |

(a) The double bond may be in either the 1- or 2-position.

---

### $C_{15}H_{14}$

**1-(Cyclopenten-1′-yl)-naphthalene**



M. P., °C

−2 (a)[1]

B. P., °C @ 760mm

| | |
|---|---|
| 165–168 | 1[1] |
| 115 | 0.04[2] |

$D_4^{20}$

| | |
|---|---|
| 1.0611 | 24° [2] |

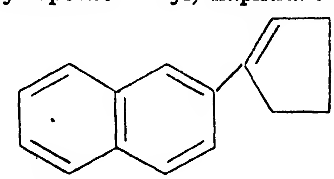
$n_D^{20}$

1.6285[2]

(a) This constant was given as a freezing point in the literature.

---

**2-(Cyclopenten-1′-yl)-naphthalene**



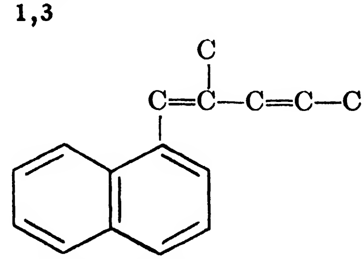
M. P., °C

85–86[1]

---

### $C_{16}H_{16}$

**1-(1′-Naphthyl)-2-methylpentadiene-1,3**



B. P., °C @ 760mm

| | |
|---|---|
| 178–181 | 12[5] |

$D_4^{20}$

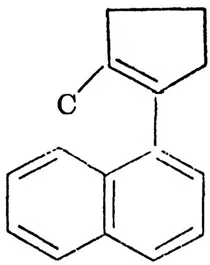
0.9801 25°[5]

$n_D^{20}$

1.56967 25°[5]

---

**1-(1′-Naphthyl)-2-methylcyclopentene-1**



B. P., °C @ 760mm

165–168 1[1]

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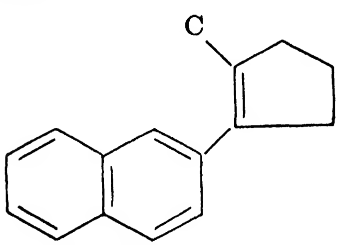
**1-(2′-Naphthyl)-2-methylcyclopentene-1**



B. P., °C @ 760mm

180–182 1[1]

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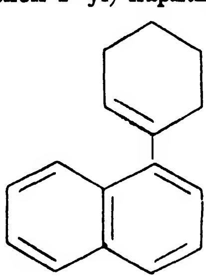
**1-(Cyclohexen-1′-yl)-naphthalene**



M. P., °C

46[10]

44[10]

36[23]

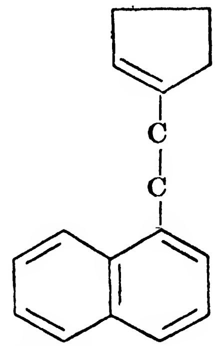
B. P., °C @ 760mm

332[23]

---

## $C_{17}H_{18}$

**1-(Cyclopenten-1′-yl)-2-(1″-naphthyl)-ethane**



B. P., °C @ 760mm

164 4–5[8]

$D_4^{20}$

1.0298[8]

$n_D^{20}$

1.6034[8]

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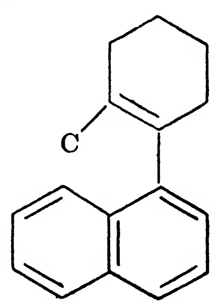
**1-(1′-Naphthyl)-2-methylcyclohexene-1**



M. P., °C

55–56[18]

B. P., °C @ 760mm

125 0.3[11]

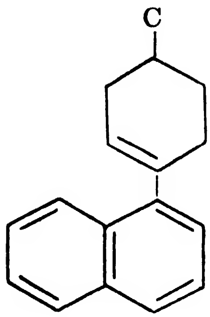
$D_4^{20}$

1.036 15.5°[11]

$n_D^{20}$

1.6111 15°[11]

**1-(1′-Naphthyl)-4-methylcyclohexene-1**



B. P., °C @ 760mm

| | |
|---|---|
| 142 | 0.15[3] |

$n_D^{20}$

| | |
|---|---|
| 1.6040 | 14° [3] |

---

**1-(1′-Naphthyl)-x-methylcyclohexene-1 (a)**

B. P., °C @ 760mm

| | |
|---|---|
| 131 | 0.2[3] |

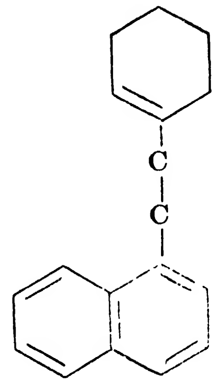
$n_D^{20}$

| | |
|---|---|
| 1.6054 | 14° [3] |

(a) The methyl group may be in either the 3- or 5-position.

---

**1-(Cyclohexen-1′-yl)-2-(1″-naphthyl)-ethane**



B. P., °C @ 760mm

| | |
|---|---|
| 167–168 | 3–4[9] |
| 135 | 0.1[7] |

$D_4^{20}$

| | |
|---|---|
| 1.0254 | 23.5° [9] |
| 1.0158 | 8° [7] |

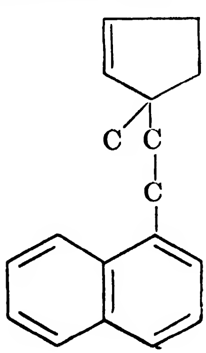
$n_D^{20}$

| | |
|---|---|
| 1.5993 | 23.6° [9] |
| 1.5992 | 8° [7] |

---

## $C_{18}H_{20}$

**1-(1′-Methylcyclopentene-2′-yl)-2-(1″-naphthyl)-ethane**



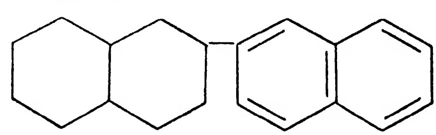
B. P., °C @ 760mm

| | |
|---|---|
| 168–172 | 0.5[14] |

---

## $C_{20}H_{24}$

**3-(2′-Naphthyl)-bicyclo-[4,4,0]-decane**



M. P., °C

67 (a)[13]

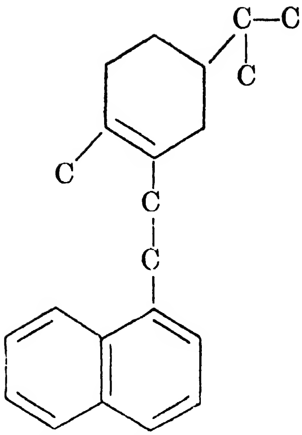
62 (a)[13]

(a) These constants were determined on isomeric forms.

---

## $C_{22}H_{28}$

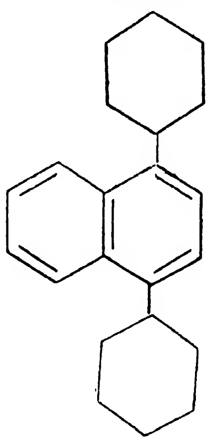
**1-(2′-Methyl-5′-isopropylcyclohexen-1′-yl)-2-(1″-naphthyl)-ethane**



B. P., °C @ 760mm

| | |
|---|---|
| 160–165 | 0.15[12] |

**1,4-Dicyclohexylnaphthalene**



M. P., °C

83–83.5[21]

**x,x-Dicyclohexylnaphthalene** (a)

M. P., °C

151–152[6]

150–151[19]

B. P., °C @ 760mm

| | |
|---|---|
| 215–225 | 7[20] |

(a) The structure of this compound was not clearly defined in the literature.

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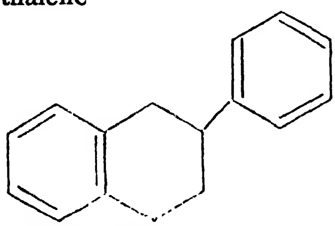
## 3. TETRAHYDRONAPHTHALENE WITH ONE PHENYL SUBSTITUTION, $C_nH_{2n-16}$

### $C_{16}H_{16}$

**2-Phenyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

| | |
|---|---|
| 180–181 | 13[10] |

$D_4^{20}$

| | |
|---|---|
| 1.0579 | 18° [10] |

$n_D^{20}$

| | |
|---|---|
| 1.5980 | 18° [10] |

**x-Phenyl-1,2,3,4-tetrahydronaphthalene** (a)

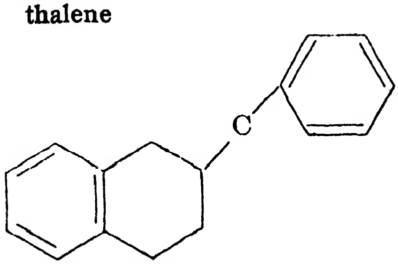
B. P., °C @ 760mm

| | |
|---|---|
| 184–187 | 14[7] |

(a) The phenyl group may be in either the 2- or 6-position.

### $C_{17}H_{18}$

**2-Benzyl-1,2,3,4-tetrahydronaphthalene**



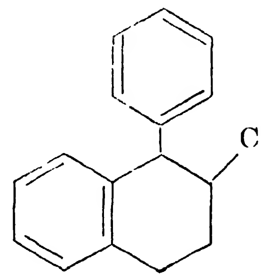

B. P., °C @ 760mm

| | |
|---|---|
| 195 | 13[1] |
| 194–195 | 13[8] |
| 193 | 13[4] |

$D_4^{20}$

| | |
|---|---|
| 1.0428 | 22.5° [4] |

**1-Phenyl-2-methyl-1,2,3,4-tetrahydronaphthalene**

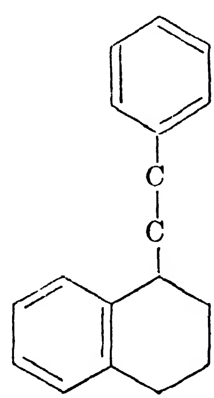



M. P., °C

46–47[3]

### $C_{18}H_{20}$

**1-Phenethyl-1,2,3,4-tetrahydronaphthalene**




B. P., °C @ 760mm

| | |
|---|---|
| 204–208 | 14[9] |

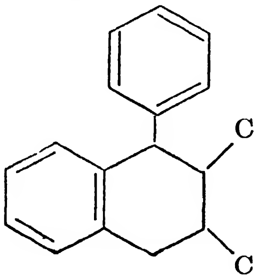
$D_4^{20}$

| | |
|---|---|
| 1.028 | 18° [9] |

$n_D^{20}$

| | |
|---|---|
| 1.5770 | 18° [9] |

**1-Phenyl-2,3-dimethyl-1,2,3,4-tetrahydronaphthalene**
(Methronol)

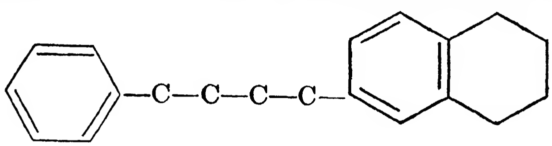


B. P., °C @ 760mm
322–323[2]

*This series continued on next page*

$C_{20}H_{24}$

**1-Phenyl-4-[6′-(1′,2′,3′,4′-tetrahydronaphthyl)]-butane**

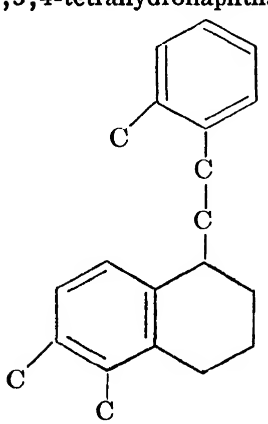


B. P., °C @ 760mm
236–237 13[6]

$D_4^{20}$
1.0172 22.5° [6]

$C_{21}H_{26}$

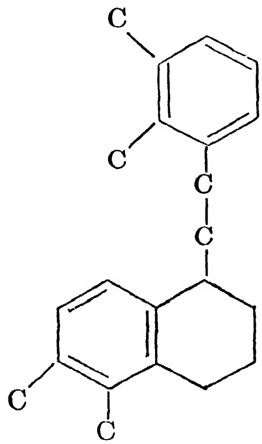
**1-(2′-Methylphenethyl)-5,6-dimethyl-1,2,3,4-tetrahydronaphthalene**



M. P., °C
53–54[5]

$C_{22}H_{28}$

**1-(2′,3′-Dimethylphenethyl)-5,6-dimethyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

165 [1][5]

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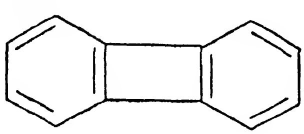
## 4. BIPHENYLENE, FLUORENE, AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-16}$

$C_{12}H_8$

**Biphenylene**



M. P., °C

111–112[66]
109–110[48]
74.5–75[22]
74–75[59]

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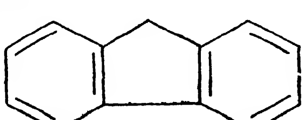
$C_{13}H_{10}$

**Fluorene**



M. P., °C

**114**
116–117[4, 49]
116[16, 76, 77, 81]
115–116[80]
115.0–115.8[61]
115–115.5[77]
115.4[37]
115[20, 35, 44, 46, 67, 75]
114–115[78]
113–115[33]
114.8[9]
114.5[56]
114–114.5[15]
113.5–114.5[19, 77]
114.2[55]
114[25, 68, 69, 72]
113–114[26, 30, 42, 48]
113–113.5[77]
113.3[54]
113(a)
112–113(b)
112.5[39, 40]
112.3[23, 24]
112.2[40]
112.0[40]
112[47, 51]

B. P., °C @ 760mm

**297.2**
305[12, 14, 29, 74]
298.0[55]
296[32]
295[52, 76]
294–295[28, 63]
293–295[49, 75]
294[62]

| | |
|---|---|
| 300.4 | 812.3[55] |
| 299.8 | 801.3[55] |
| 295.7 | 738.8[55] |
| 295.6 | 738.8[55] |
| 277.1 | 490.7[55] |
| 276.6 | 487.5[55] |
| 241.4 | 208.4[55] |
| 240.4 | 205.5[55] |
| 203.0 | 70.5[55] |
| 202.5 | 69.5[55] |
| 170 | 26[65] |
| 161.0 | 18.0[55] |

$D_4^{20}$

1.181(c) (solid)[41]
1.200(c) (solid)[57]
1.207(c) (solid)[24]

$n_D^{20}$

(d)

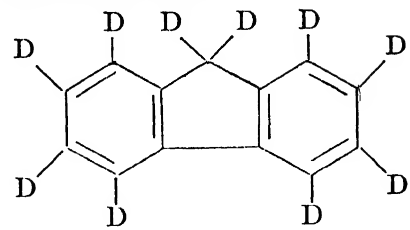
Additional Data

$$\frac{1}{T_b} = 0.0027238 - 0.0003369 \log_{10} p_{mm}$$

(200 to 813 mm)

(a) The melting point 113 is found in references 1, 2, 3, 8, 10, 11, 12, 13, 14, 17, 27, 32, 36, 38, 45, 50, 52, 53, 60, 62, 65, 70, 71, 73, 74.
(b) The melting point 112–113 is found in references 5, 6, 7, 21, 28, 31, 63, 64, 79.
(c) The temperature of this determination was not given.
(d) Refractive indices at other lines are found in reference 58.

**Decadeuterofluorene**



M. P., °C

115–117[18]

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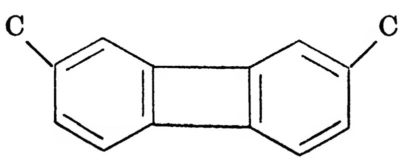
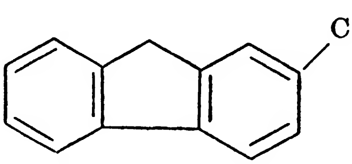
## $C_{14}H_{12}$

### 2,7-Dimethylbiphenylene



M. P., °C
112[17]

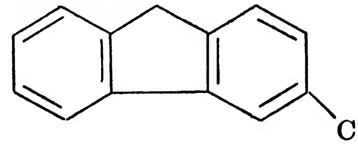
### 2-Methylfluorene



M. P., °C
104–105[21, 22]
104[14]
102–103[11]

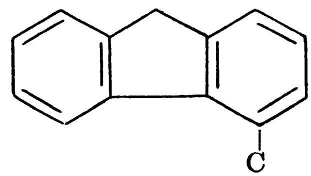
B. P., °C @ 760mm
317–319[14]

### 3-Methylfluorene



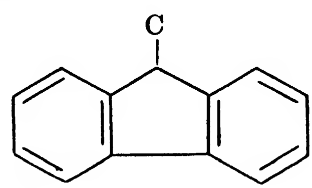
M. P., °C
88–89[20, 23]
88[33]

### 4-Methylfluorene



M. P., °C
71.5–72.5[29]
63[19]

### 9-Methylfluorene



M. P., °C
45.5
48[12]
46–47[35]
46[25, 37]
45–46[5, 34]
45[2, 30, 32, 36]
44.5[4]
44[31]

B. P., °C @ 760mm

| | |
|---|---|
| 157 | 18[27] |
| 141–144 | 16[32] |
| 154–156 | 15[36] |

$D_4^{20}$

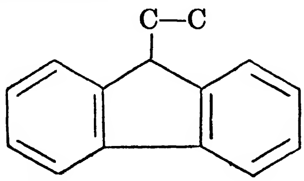
| | |
|---|---|
| 1.070[18] | |
| 1.0263 | 66.2°[32] |

$n_D^{20}$

| | |
|---|---|
| 1.631[18] | |
| 1.61009 | 66.2° [32] |
| 1.60233 | $n_{H\alpha}^{66.2}$ [32] |
| 1.63189 | $n_{H\beta}^{66.2}$ [32] |

## $C_{15}H_{14}$

**9-Ethylfluorene**



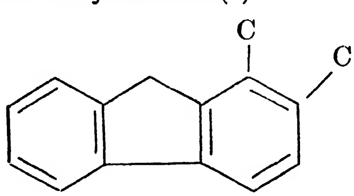

M. P., °C

108[37]
107–108[35]
106–107[28]
105[27]

B. P., °C @ 760mm

| | |
|---|---|
| 306–310[25] | |
| 170 | 18[27] |
| 169–171 | 14[36] |
| 165–166 | 13[35] |

**1,2-Dimethylfluorene** (a)

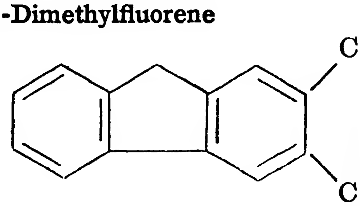



M. P., °C

107–108[10]

(a) The structure of this compound was not clearly defined in the literature.

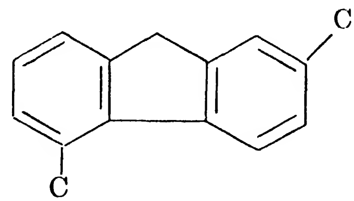
**2,3-Dimethylfluorene**




M. P., °C

125–126[1]
125[1, 9]

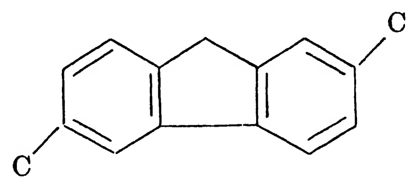
**2,5-Dimethylfluorene**




M. P., °C

58–59[24]

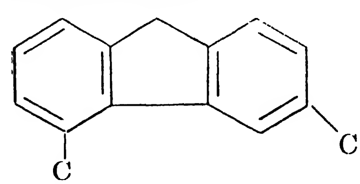
**2,6-Dimethylfluorene**




M. P., °C

66–67[15, 16]

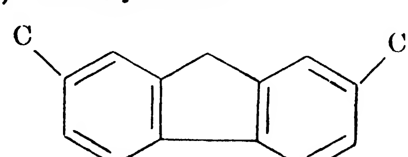
**3,5-Dimethylfluorene**




M. P., °C

81–82[16]

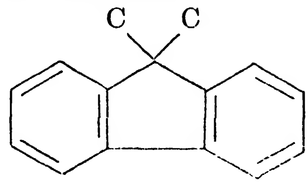
**2,7-Dimethylfluorene**




M. P., °C

114–115[16]

**9,9-Dimethylfluorene**



M. P., °C
70[2]

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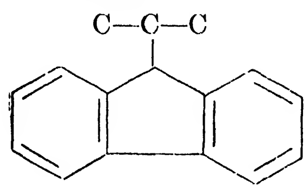
$C_{16}H_{16}$

**9-Isopropylfluorene**



M. P., °C
54–55[4]
53–55[18]

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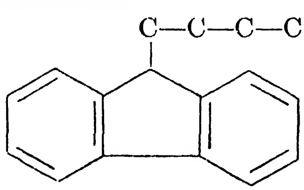
$C_{17}H_{18}$

**9-*n*-Butylfluorene**



M. P., °C
101[28]

B. P., °C @ 760mm
192–195 33[28]

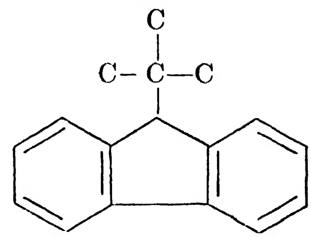
---

**x-Isobutylfluorene** (a)

M. P., °C
68–70[8]

(a) The structure of this compound was not clearly defined in the literature.

**9-*tert*-Butylfluorene** (a)



M. P., °C
101–102[6]
98–99[26]

(a) The structure of this compound was not clearly defined in the literature.

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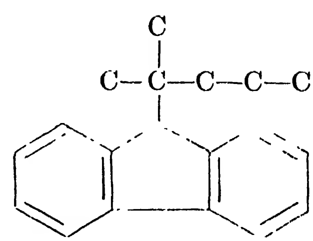
$C_{19}H_{22}$

**2-Methyl-2-(9′-fluoryl)-pentane** (a)



M. P., °C
84–85[6, 7]

(a) The structure of this compound was not clearly defined in the literature.

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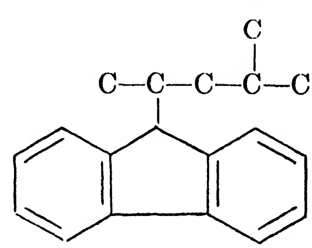
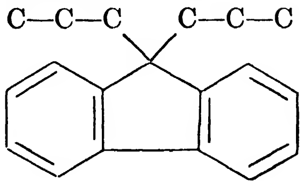
**2-Methyl-4-(9′-fluoryl)-pentane**



M. P., °C
101–103[18]

## 9,9-Di-*n*-propylfluorene



M. P., °C
37–38[3]

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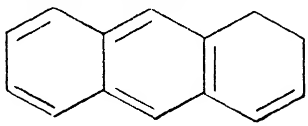
## 5. DIHYDROANTHRACENES, DIHYDROPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-16}$

### $C_{14}H_{12}$

**1,2-Dihydroanthracene**



M. P., °C

150[79]

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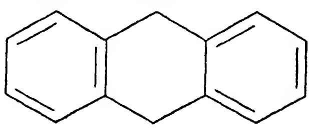
**9,10-Dihydroanthracene**



M. P., °C

108
111[18]
108–110[15]
108.0–109.8[58]
108–109[27]
107–109[71]
108.5[9, 52, 71, 82]
108 (a)
107–108[37, 45, 48]
106–108[63]
107[43, 74, 80]
106–107[14]
106–106.5[62]
106[25, 26, 66]
105[10]
104–105[53, 61]

B. P., °C @ 760mm

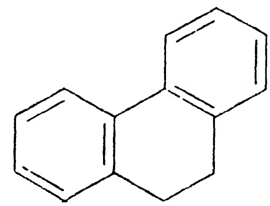
| | |
|---|---|
| 315[82] | |
| 313[43] | |
| 305[25] | |
| 302–303[26] | |
| 165–170 | 13[37] |

$D_4^{20}$

| | |
|---|---|
| 0.88951 | 10.3° [62] |

(a) The melting point 108 is found in references 32, 40, 41, 47, 49, 70, 75, 80, 81.

**9,10-Dihydrophenanthrene**



M. P., °C

96[78]
94–95[68, 69]
94[31, 60]
35[4]
34.5–35[65]
33.8–34.4[19]
32–33[22]

B. P., °C @ 760mm

| | |
|---|---|
| 314[31] | |
| 312–314 | 740[68] |
| 312–314 | 739[69] |
| 212–213 | 60[12] |
| 176–178 | 20[19] |
| 158 | 11[65] |
| 154 | 7.5[22] |
| 140–142 | 6[19] |

$D_4^{20}$

| | |
|---|---|
| 1.0940 | 24.5° [78] |
| 1.0942 | 24.5° [78] |

$n_D^{20}$

| | |
|---|---|
| 1.6406 | 25° [19] |
| 1.62093 | $n_{H\alpha}^{24.5}$ [78] |
| 1.62128 | $n_{H\alpha}^{24.5}$ [78] |
| 1.65269 | $n_{H\beta}^{24.5}$ [78] |
| 1.65312 | $n_{H\beta}^{24.5}$ [78] |
| 1.62979 | $n_{He}^{24.5}$ [78] |
| 1.63015 | $n_{He}^{24.5}$ [78] |

---

**x,x-Dihydrophenanthrene** (a)

M. P., °C

34.5–35[72]

B. P., °C @ 760mm

| | |
|---|---|
| 168–170 | 15[67] |
| 168–169 | 15[72] |

$D_4^{20}$

| | |
|---|---|
| 1.0757 | 40° [72] |
| 1.0953 | 14° [72] |

(a) The structure of this compound was not clearly defined in the literature.

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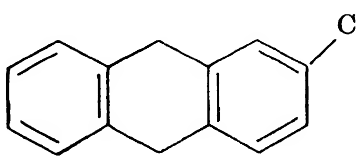
## $C_{15}H_{14}$

### 2-Methyl-9,10-dihydroanthracene



M. P., °C
51[23]

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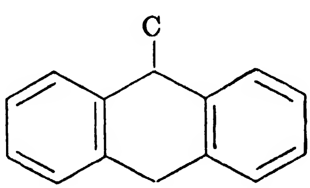
### 9-Methyl-9,10-dihydroanthracene



M. P., °C
61.5–62[73]

---

### 1-Methyl-x,x-dihydroanthracene (a)

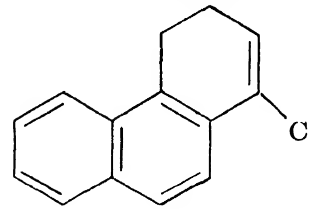
M. P., °C
30[24]

B. P., °C @ 760mm

| | |
|---|---|
| 314–315 | 740[24] |

(a) The structure of this compound was not clearly defined in the literature.

### 1-Methyl-3,4-dihydrophenanthrene



M. P., °C
86.0–86.5[5]

---

## $C_{16}H_{16}$

### 9-Ethyl-x,x-dihydroanthracene (a)

B. P., °C @ 760mm
320–323[45]
320[46]

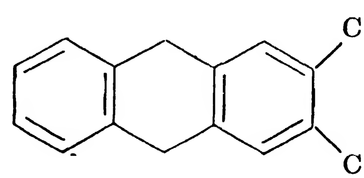
$D_4^{20}$

| | |
|---|---|
| 1.049 | $D_{18}^{18}$ [45, 46] |

(a) The structure of this compound was not clearly defined in the literature.

---

### 2,3-Dimethyl-9,10-dihydroanthracene



M. P., °C
122[8]

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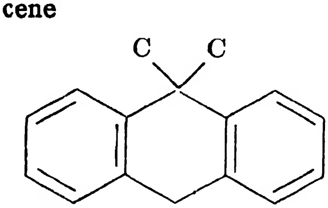
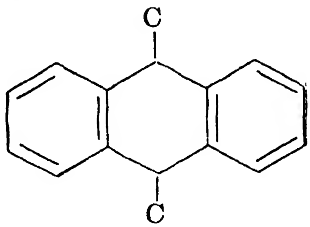
### 9,9-Dimethyl-9,10-dihydroanthracene



M. P., °C
56[28]

**9,10-Dimethyl-9,10-dihydroanthracene**



M. P., °C
**181**
181–182[3]
181–181.5[2]
181[16]
179–181[17]
178–179[1, 11]

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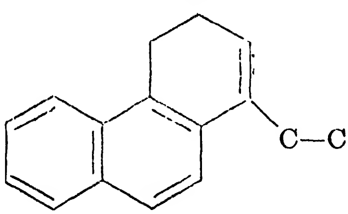
**1-Ethyl-3,4-dihydrophenanthrene**



M. P., °C
42–43[5]

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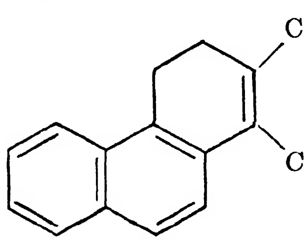
**1,2-Dimethyl-3,4-dihydrophenanthrene**



M. P., °C
99–100[30]

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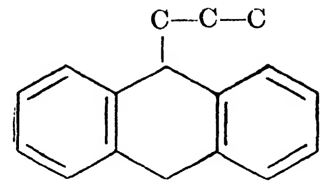
$C_{17}H_{18}$

**9-*n*-Propyl-9,10-dihydroanthracene**



B. P., °C @ 760mm
175–176 11[73]

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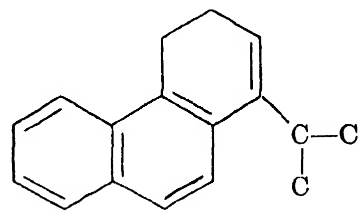
**1-Isopropyl-3,4-dihydrophenanthrene**



M. P., °C
66–67[5]

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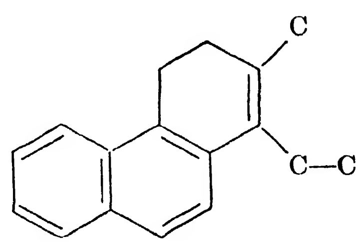
**1-Ethyl-2-methyl-3,4-dihydrophenanthrene**



M. P., °C
77–78[30]

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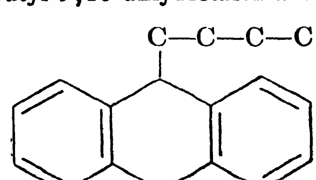
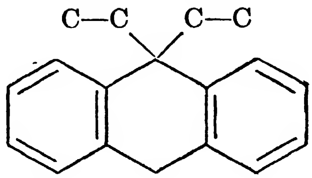
$C_{18}H_{20}$

**9-*n*-Butyl-9,10-dihydroanthracene**



B. P., °C @ 760mm
191–192 11[73]

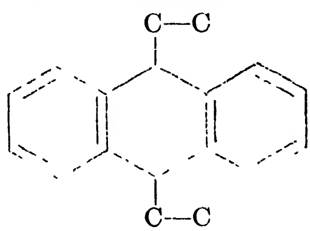
**9,9-Diethyl-9,10-dihydroanthracene**



M. P., °C
210[36]

---

**9,10-Diethyl-9,10-dihydroanthracene**



$D_4^{20}$

| | |
|---|---|
| 1.014[64] | |
| 1.0132 | 21° [44] |

---

**x,x-Diethyl-x,x-dihydroanthracene (a)**

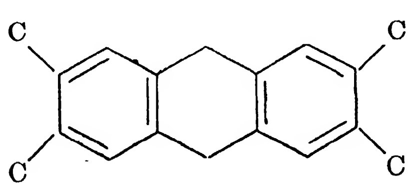
$D_4^{20}$

| | |
|---|---|
| 0.9634 | 100° [21] |
| 0.9949 | 50° [21] |
| 1.0264 | 0° [21] |

(a) The structure of this compound was not clearly defined in the literature.

---

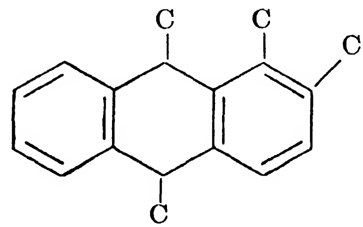
**2,3,6,7-Tetramethyl-9,10-dihydroanthracene**



B. P., °C @ 760mm
217–219[54]

---

**1,2,9,10-Tetramethyl-9,10-dihydroanthracene**



M. P., °C
100–101[7]

---

**1,3,5,7-Tetramethyl-x,x-dihydroanthracene (a)**

M. P., °C
132–133[83]

(a) The structure of this compound was not clearly defined in the literature.

---

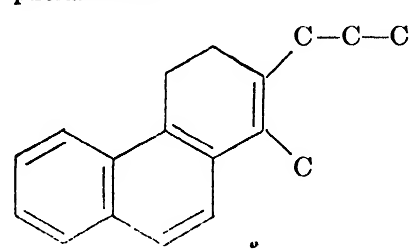
**$x_4$-Tetramethyl-x,x-dihydroanthracene (a)**

M. P., °C
171–171.5[3]
170.5–171[2]

(a) The structure of this compound was not clearly defined in the literature.

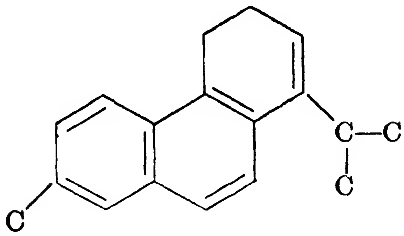
---

**1-Methyl-2-*n*-propyl-3,4-dihydrophenanthrene**



B. P., °C @ 760mm
208–210 13[39]

**1-Isopropyl-7-methyl-3,4-dihydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 150 | 2[59] |

---

**1-Methyl-7-isopropyl-x,x-dihydrophenanthrene** (a)

M. P., °C

64–65[38, 55, 76]

B. P., °C @ 760mm

| | |
|---|---|
| 375–376[57] | |
| 188–190 | 10[76] |

$D_4^{20}$

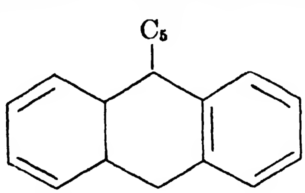
1.027[57]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{19}H_{22}$

**9-Isopentyl-9,10-dihydroanthracene**



B. P., °C @ 760mm

| | |
|---|---|
| 200 | 23[77] |
| 201–205 | 17[77] |

$D_4^{20}$

| | |
|---|---|
| 1.016[77] | |
| 1.025[77] | |
| 1.0022 | 45.1° [77] |
| 0.9940 | 44.4° [77] |

$n_D^{20}$

| | |
|---|---|
| 1.5736[77] | |
| 1.5771[77] | |
| 1.56584 | 45.1° [77] |
| 1.56261 | 44.4° [77] |
| 1.56091 | $n_{H\alpha}^{45.1}$ [77] |
| 1.55791 | $n_{H\alpha}^{44.4}$ [77] |
| 1.58047 | $n_{H\beta}^{45.1}$ [77] |
| 1.57651 | $n_{H\beta}^{44.4}$ [77] |
| 1.58868 | $n_{H\gamma}^{44.4}$ [77] |

---

**x-Pentyl-x,x-dihydroanthracene** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 350[46] | |
| 291–292 | 570[46] |

$D_4^{20}$

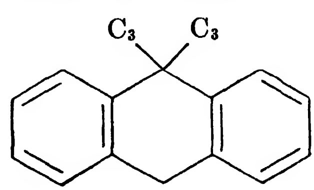
| | |
|---|---|
| 1.031 | 18° [46] |

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{20}H_{24}$

**9,9-Dipropyl-9,10-dihydroanthracene**



M. P., °C

46–47[29]

---

**x,x-Diisopropyl-9,10-dihydroanthracene** (a)

M. P., °C

90[20]

(a) The structure of this compound was not clearly defined in the literature.

**1-Methyl-4-ethyl-7-isopropyl-x,x-dihydrophenanthrene** (a)

M. P., °C

51–52.5[55]

51–52[55]

51[56]

B. P., °C @ 760mm

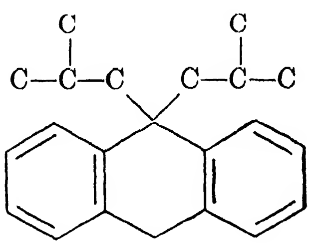
223–225 7.5[56]

(a) The structure of this compound was not clearly defined in the literature.

---

$C_{22}H_{28}$

**9,9-Diisobutyl-9,10-dihydroanthracene**



M. P., °C

97–98[50]

B. P., °C @ 760mm

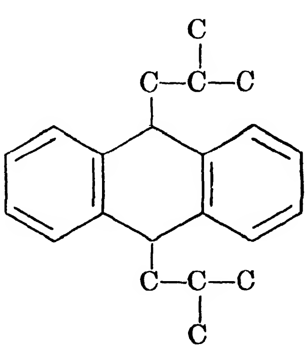
140–143 0.01[50]

$n_D^{20}$

1.5595[50]

---

**9,10-Diisobutyl-9,10-dihydroanthracene**



B. P., °C @ 760mm

142 0.5[42]

$D_4^{20}$

0.9899[42]

0.9902[51]

$n_D^{20}$

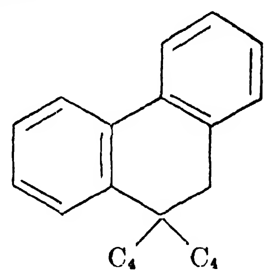
1.56336[42]

1.55830 $n_{H\alpha}^{20}$ [42]

1.57600 $n_{H\beta}^{20}$ [42]

---

**9,9-Dibutyl-9,10-dihydrophenanthrene**



M. P., °C

76[13]

---

**x,x-Diisobutyl-x,x-dihydrophenanthrene** (a)

$D_4^{20}$

0.9305 23° [34]

(a) The structure of this compound was not clearly defined in the literature.

---

**1-Methyl-x,x-diethyl-7-isopropyl-x,x-dihydrophenanthrene** (a)

B. P., °C @ 760mm

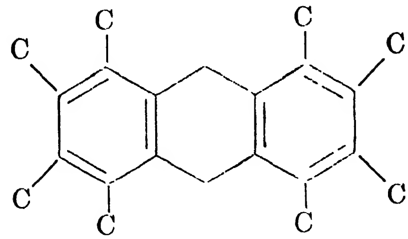
238–241 9[55]

$D_4^{20}$

1.0055[55]

(a) The structure of this compound was not clearly defined in the literature.

**1,2,3,4,5,6,7,8-Octamethyl-9,10-dihydroanthracene**

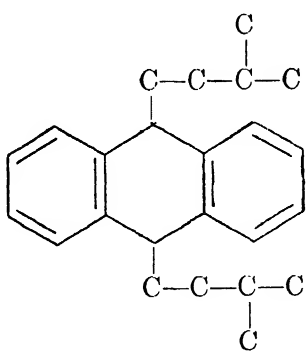


M. P., °C

283–284[6]

## $C_{24}H_{32}$

**9,10-Di-(3′-methylbutyl)-9,10-dihydroanthracene**



$D_4^{20}$

| | |
|---|---|
| 0.9720 | |
| 0.972[64] | |
| 0.9130 | 100°[21] |
| 0.9499 | 50°[21] |
| 0.9713 | 21°[35] |
| 0.9868 | 0°[35] |

$n_D^{20}$

| | |
|---|---|
| 1.5640 | 25°[64] |
| 1.5670 | 10°[35] |

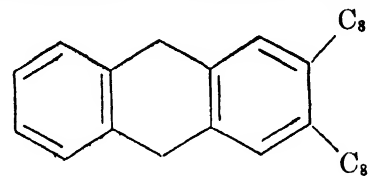
Additional Data

$$\frac{dD}{dt} = -0.0007380/°C$$

(0 to 100 °C)

## $C_{30}H_{44}$

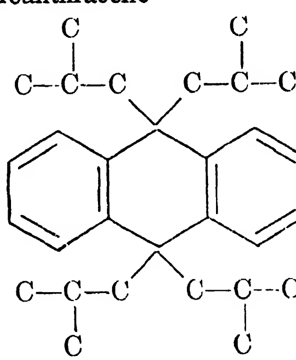
**2,3-Dioctyl-9,10-dihydroanthracene**



$D_4^{20}$

| | |
|---|---|
| 0.948[64] | |
| 0.9016 | 100°[21] |
| 0.9331 | 50°[21] |
| 0.9646 | 0°[21] |

**9,9,10,10-Tetraisobutyl-9,10-dihydroanthracene**



M. P., °C

177.5[42]

$n_D^{20}$

| | |
|---|---|
| 1.548 (a) | $n_{H\alpha}$[50] |
| 1.603 (a) | $n_{H\gamma}$[50] |

(a) The temperature of this determination was not given.

## $C_{34}H_{52}$

**$x_4$-Tetraisoamyl-x,x-dihydroanthracene (a)**

M. P., °C

168–170[33]

(a) The structure of this compound was not clearly defined in the literature.

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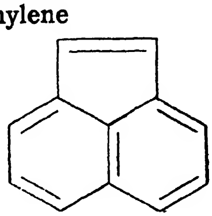
## 6. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-16}$

### $C_{12}H_8$

**Acenaphthylene**



M. P., °C

**93**
93–94[30]
93[14, 29]
92–93 (a)
92[31, 44]

B. P., °C @ 760mm

270[44]
236[27]
175.5–176.5[35]

$D_4^{20}$

0.88469 15.05° [56]

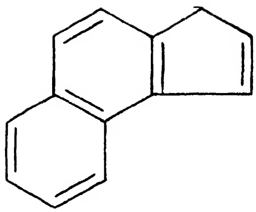
Additional Data

Sublimation Temp. (°C) 86.5° [38]

(a) The melting point 92–93 is found in references 5, 6, 9, 13, 32, 33, 52, 55, 56.

### $C_{13}H_{10}$

**4,5-Benzoindene**



M. P., °C
48.5–50[49]

B. P., °C @ 760mm
173 33[49]

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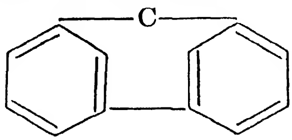
**3,3′-Diphenylenemethane**

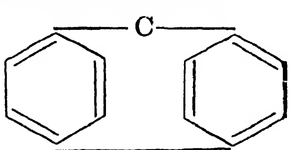



M. P., °C
118[15]

B. P., °C @ 760mm
295[15]

---

**4,4′-Diphenylenemethane**



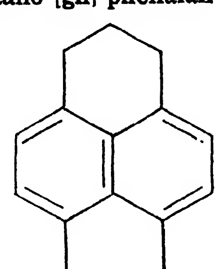

M. P., °C
208[15, 54]

B. P., °C @ 760mm
320[54]

---

## $C_{15}H_{14}$

**Cyclopentano-[gh]-phenalan**



M. P., °C
122[12]

B. P., °C @ 760mm
168–170 1–3[12]

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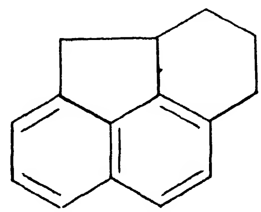
**Cyclopentano-[def]-1,2,3,4-tetrahydrophenanthrene**



M. P., °C
54.5–55.5[1]

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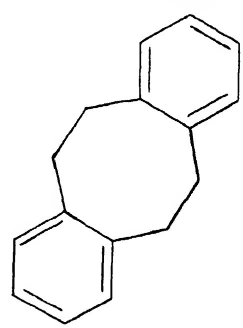
## $C_{16}H_{16}$

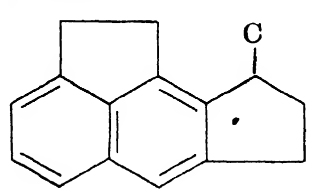
**1,2,5,6-Dibenzocyclooctane**



M. P., °C
108.5[3]

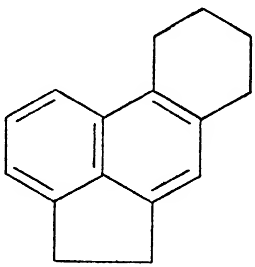
---

**3,4-(3′-Methylcyclopentano)-acenaphthene**



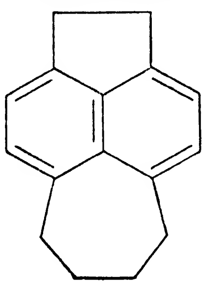
M. P., °C
38–38.5[34]
B. P., °C @ 760mm
143–148 1[34]

**Cyclopentano-[jk]-1,2,3,4-tetrahydrophenanthrene**



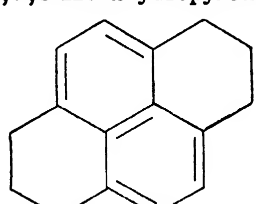
M. P., °C
92.5[37]

**Cycloheptano-[fg]-acenaphthene**



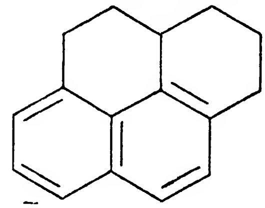
M. P., °C
138[36]

**1,2,3,6,7,8-Hexahydropyrene**



M. P., °C
133[41]
131–132[47]
129–130[51]
129[57]
127[43, 45]

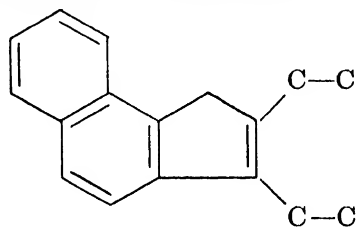
**1,2,3,9,10,10a-Hexahydropyrene**



M. P., °C
106[26]
105–105.5[22]

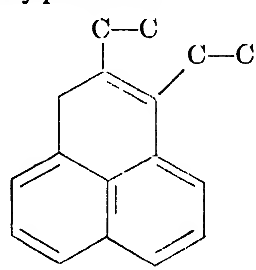
## $C_{17}H_{18}$

**2,3-Diethyl-6,7-benzoindene**



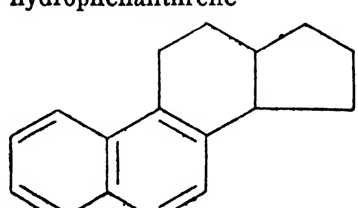

B. P., °C @ 760mm
205–207 16[53]

**2,3-Diethylphenalene**




B. P., °C @ 760mm
185 13[53]

**1,2-Cyclopentano-1,2,3,4-tetrahydrophenanthrene**



M. P., °C
133–134.5[20]

B. P., °C @ 760mm
160–161 (a) 3–4[20]

$D_4^{20}$
1.0859 (a)[20]

$n_D^{20}$
1.6256 (a) 20.2° [20]

(a) This constant was determined on the *trans* isomer of the compound.

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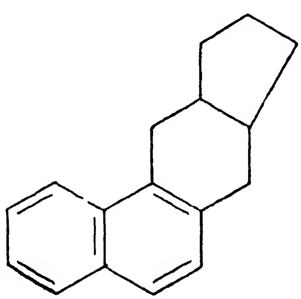
**2,3-Cyclopentano-1,2,3,4-tetrahydrophenanthrene**



M. P., °C
119–121[8]

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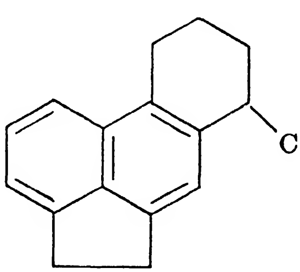
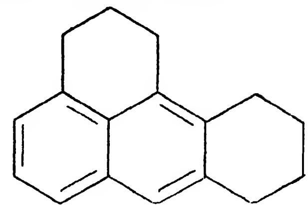
**Cyclopentano-[jk]-1-methyl-1,2,3,4-tetrahydrophenanthrene**



M. P., °C
133[37]

**4,5-Cyclohexanophenalan**



B. P., °C @ 760mm
228–230 16[59]

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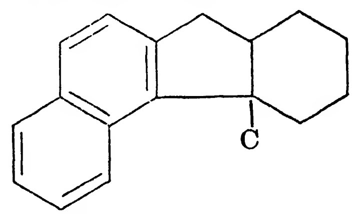
## $C_{18}H_{20}$

**4a-Methyl-5,6-benzo-1,2,3,4,4a,9a-hexahydrofluorene**



B. P., °C @ 760mm
200–205 7[17]

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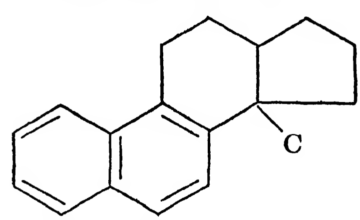
**1-Methyl-1,2-cyclopentano-1,2,3,4-tetrohydrophenanthrene**



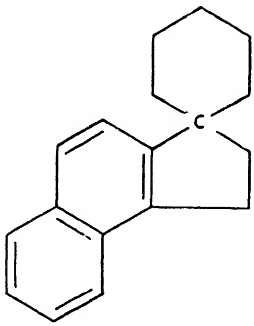
B. P., °C @ 760mm
155 0.4[46]

$D_4^{20}$
1.0692[50]
1.04552 18.9° [46]

$n_D^{20}$
1.6176[50]
1.61363 18.9° [46]

---

**Spiro[4,5-benzoindane-1,1′-cyclohexane]**



M. P., °C
56–57[16]

B. P., °C @ 760mm
140 0.1[16]

---

**$x_8$-Octahydro-1,2-benzoanthracene (a)**

M. P., °C
124.5–125.5[24]

(a) The structure of this compound was not clearly defined in the literature.

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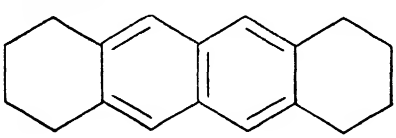
**1,2,3,4,7,8,9,10-Octahydronaphthacene**



M. P., °C
174[60]

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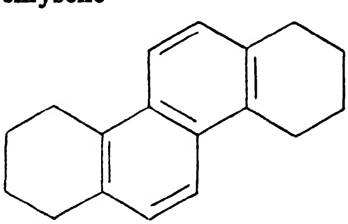
**1,2,3,4,7,8,9,10-Octahydrochrysene**

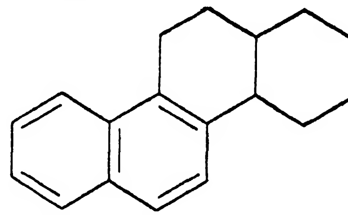


M. P., °C
138–140[61]
136–138[16]

B. P., °C @ 760mm
180–181 0.2[61]

---

**1,2,3,4,4a,11,12,12a-Octahydrochrysene**



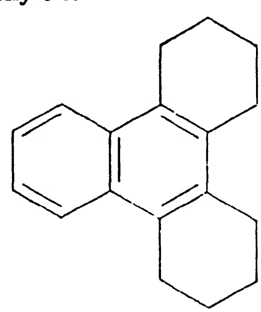
M. P., °C
114–114.5 (a)[21]
78–79 (b)[21]

(a) This constant was determined on the *trans* isomer of the compound.

(b) This constant was determined on the *cis* isomer of the compound.

---

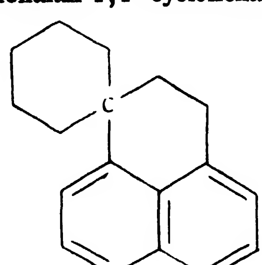
**1,2,3,4,5,6,7,8-Octahydrotriphenylene**



M. P., °C
117.5–119.5[2]

---

**Spiro[phenalan-1,1′-cyclohexane]**



M. P., °C
55–56[21]
B. P., °C @ 760mm
176–177[21]
$D_4^{20}$

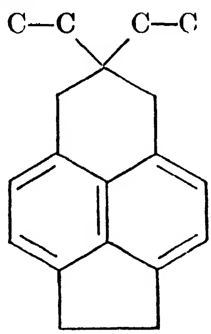
| | |
|---|---|
| 1.0809 | 23.5° [21] |

$n_D^{20}$

| | |
|---|---|
| 1.6197 | 23.6° [21] |

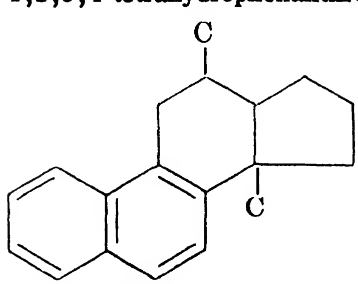
## $C_{19}H_{22}$

**Cyclopentano-[gh]-2,2-diethyl-phenalan**



M. P., °C
93–95[39, 40]

**1,2-Cyclopentano-1,3-dimethyl-1,2,3,4-tetrahydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 160 | 0.4[46] |

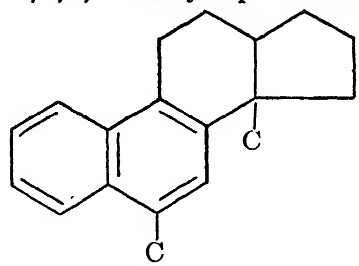
$D_4^{20}$

| | |
|---|---|
| 1.04203 | 18.2° [46] |

$n_D^{20}$

| | |
|---|---|
| 1.60681 | 18.2° [46] |

**1,2-Cyclopentano-1,9-dimethyl-1,2,3,4-tetrahydrophenanthrene**



B. P., °C @ 760mm

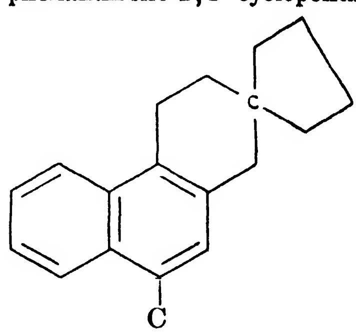
| | |
|---|---|
| 160 | 0.5[42] |

**Spiro[x-methyl-5,6-benzoindane-1,1′-cyclohexane]** (a)

M. P., °C
109–110[23]

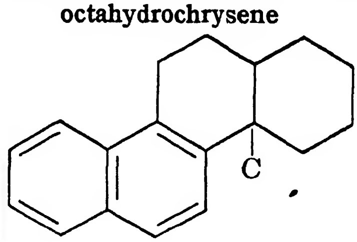
(a) The structure of this compound was not clearly defined in the literature.

**Spiro[9-methyl-1,2,3,4-tetrahydrophenanthrene-2,1′-cyclopentane]**



M. P., °C
69–70[58]

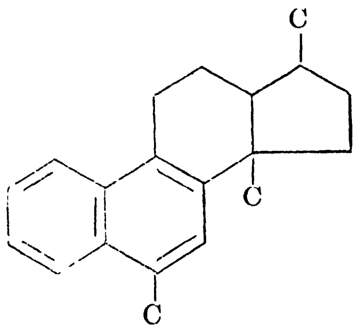
**4a-Methyl-1,2,3,4,4a,11,12,12a-octahydrochrysene**



B. P., °C @ 760mm
145 0.1[19]

## $C_{20}H_{24}$

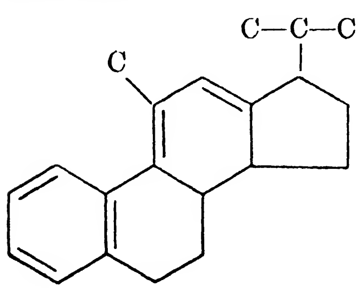
**1,2-(3'-Methylcyclopentano)-1,9-dimethyl-1,2,3,4-tetrahydrophenanthrene**



B. P., °C @ 760mm
170 0.6[42]

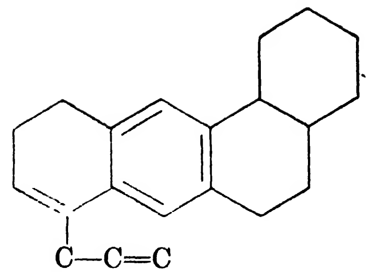
## $C_{21}H_{26}$

**1,2-(3'-Isopropylcyclopentano)-4-methyl-1,9,10,10a-tetrahydrophenanthrene**



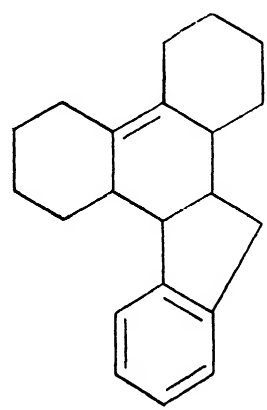
B. P., °C @ 760mm
190 0.1[10]

**1,2-Cyclohexano-5-(propen-2'-yl)-1,2,3,4,7,8-hexahydroanthracene**



B. P., °C @ 760mm
174 0.1[18]

**9,10-(1',2'-Indano)-1,2,3,4,5,6,7,8,8a,9,10,10a-dodecahydrophenanthrene**



B. P., °C @ 760mm
185–190 (a)[7]
180–185 (a)[7]

(a) These constants were determined on isomeric forms.

## $C_{22}H_{28}$

**x-Methyl-x-isopropyl-$x_8$-octahydrochrysene (a)**

M. P., °C
108[25]

(a) The structure of this compound was not clearly defined in the literature.

**$x_{14}$-Tetradecahydropicene** (a)

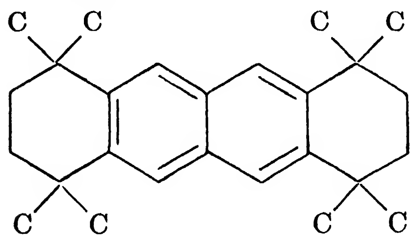
M. P., °C

285[4]

(a) The structure of this compound was not clearly defined in the literature.

### $C_{26}H_{36}$

**1,1,4,4,7,7,10,10-Octamethyl-1,2,3,4,7,8,9,10-octahydronaphthacene**



M. P., °C

319–320[11]

### $C_{33}H_{50}$

**3-Phenyl-5-cholestene** (a)

M. P., °C

152[48]

(a) The structure of this compound was not clearly defined in the literature.

**Phenylcholestane** (a)

M. P., °C

153[48]

(a) The structure of this compound was not clearly defined in the literature.

### $C_{35}H_{54}$

**3-Phenylcholestene-3** (a)

M. P., °C

94–95[28]

(a) The structure of this compound was not clearly defined in the literature.

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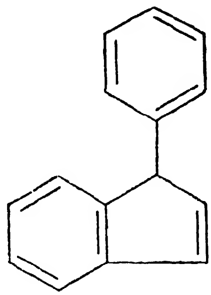
# VI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-18}$

1. Indene with One Phenyl Substitution
2. Anthracene and Its Alkyl Derivatives
3. Phenanthrene and Its Alkyl Derivatives
4. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-18}$

## 1. INDENE WITH ONE PHENYL SUBSTITUTION, $C_nH_{2n-18}$

### $C_{15}H_{12}$

**1-Phenylindene**



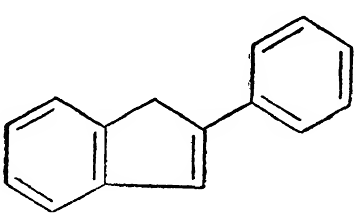
B. P., °C @ 760mm

| | |
|---|---|
| 200–201 | 29[19] |

$D_4^{20}$

| | |
|---|---|
| 1.0829 | 27° [19] |

**2-Phenylindene**



M. P., °C

167[20]

166–167[6]

B. P., °C @ 760mm

| | |
|---|---|
| 167–170 | 12[15] |
| 162–163 | 10[20] |

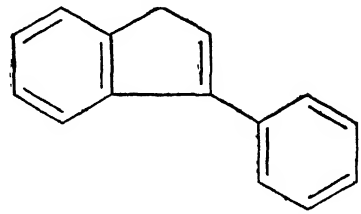
$D_4^{20}$

| | |
|---|---|
| 1.0821 | 16° [20] |

$n_D^{20}$

| | |
|---|---|
| 1.5955 | 16° [20] |

**3-Phenylindene**



B. P., °C @ 760mm

| | |
|---|---|
| 164–167 | 12[5] |
| 167–171 | 10[6] |

**x-Phenylindene** (a)

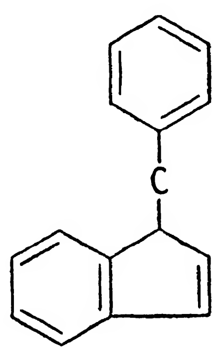
B. P., °C @ 760mm

| | |
|---|---|
| 183–187 | 17[4] |

(a) The structure of this compound was not clearly defined in the literature.

### $C_{16}H_{14}$

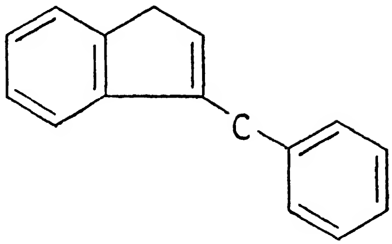
**1-Benzylindene**




B. P., °C @ 760mm

| | |
|---|---|
| 230–235 | 15[14] |
| 175–177 | 14[9] |
| 173–175 | 12[9] |

**3-Benzylindene**



M. P., °C
35[22]
34[9, 10]
33–34[21]

B. P., °C @ 760mm

| | |
|---|---|
| 185 | 18[21] |
| 175–177 | 14[10] |
| 183–185 | 13[17] |
| 179 | 11[22] |

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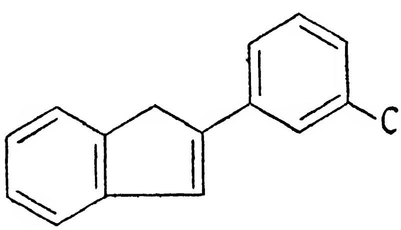
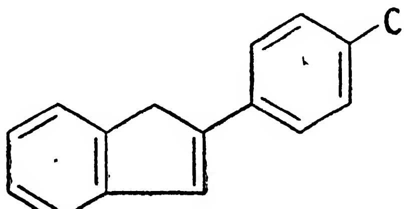
**2-*m*-Tolylindene**



M. P., °C
99–100[20]

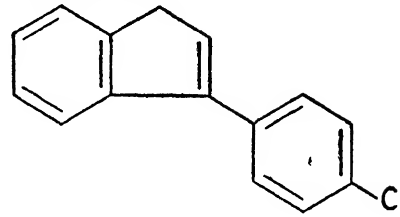
---

**2-*p*-Tolylindene**



M. P., °C
183–184[20]

**3-*p*-Tolylindene**

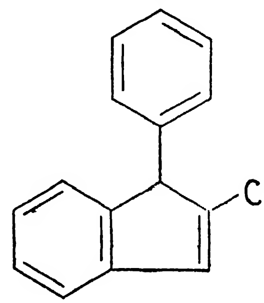


B. P., °C @ 760mm

| | |
|---|---|
| 184–188 | 11[20] |

---

**1-Phenyl-2-methylindene**



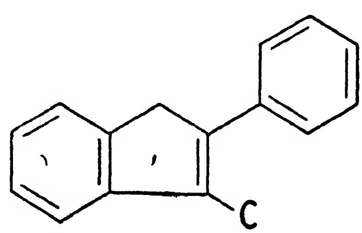
M. P., °C
57.5[15]
56.5[23]

B. P., °C @ 760mm

| | |
|---|---|
| 177 | 14[15] |

---

**2-Phenyl-3-methylindene**



M. P., °C
76–78[6]
75–76[1]

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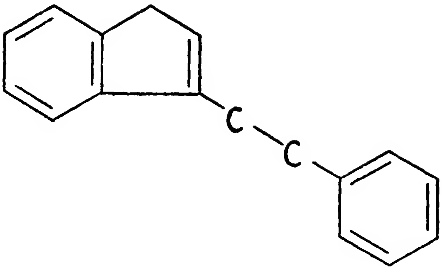
$C_{17}H_{16}$

**3-Phenethylindene**



B. P., °C @ 760mm

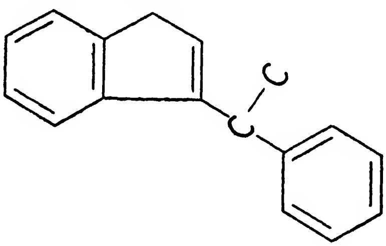
186 9[7]

$n_D^{20}$

1.5987 18.7° [7]

---

(3-Indenyl)-phenylmethylmethane



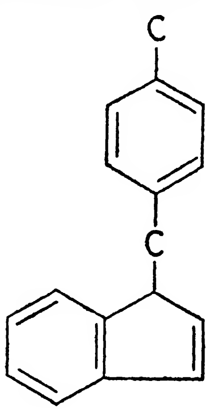
B. P., °C @ 760mm

196 15[18]

161 5[18]

---

1-(4′-Methylbenzyl)-indene



M. P., °C

27–29[3]

B. P., °C @ 760mm

218–222 12[3]

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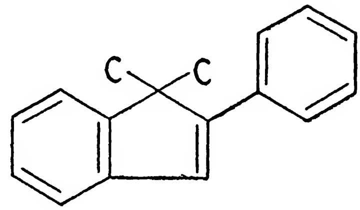
1,1-Dimethyl-2-phenylindene



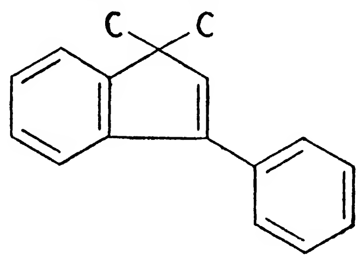
M. P., °C

61–62[12]

51[11]

---

1,1-Dimethyl-3-phenylindene



M. P., °C

50–51[2, 13]

B. P., °C @ 760mm

184–185 27[13]

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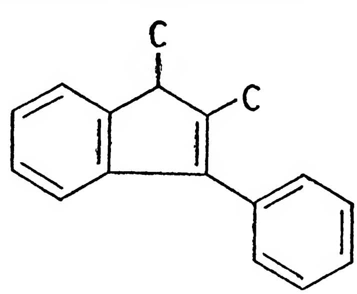
1,2-Dimethyl-3-phenylindene



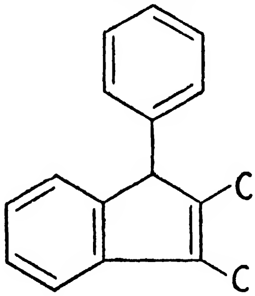
M. P., °C

68–69[16]

B. P., °C @ 760mm

145–153 4[16]

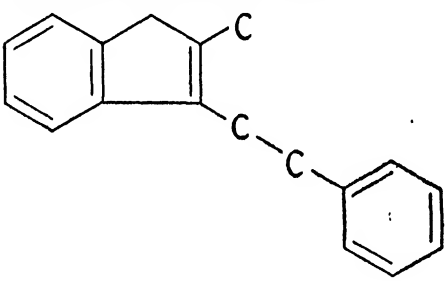
**1-Phenyl-2,3-dimethylindene**



M. P., °C
68–69[13]

$C_{18}H_{18}$

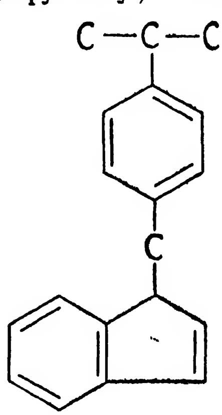
**2-Methyl-3-phenethylindene**



B. P., °C @ 760mm
170 1[8]

$C_{19}H_{20}$

**1-(4′-Isopropylbenzyl)-indene**



M. P., °C
32[3]

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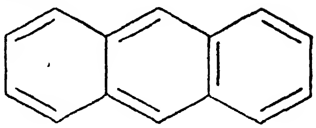
## 2. ANTHRACENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-18}$

$C_{14}H_{10}$

**Anthracene**



M. P., °C

**216.6**
219[147, 148, 149]
218[18, 23, 67, 136]
217.6[146]
217–217.5[95]
217 (a)
216–217[57, 66]
216–216.8[140]
216.4–216.7[14, 15]
216.6[104]
216.55[116]
216.5[28, 97, 112, 113]
216.0–216.5[117]
216–216.5[94]
216.4[103]
216.18[92]
216.1[128]
$216.0_5$[26]
216 (b)

B. P., °C @ 760mm

**341.4**
342.0[104]
342[114]
340.36[44]
340[67]
339.9[26, 92, 128]
339.87[44]
339.77[25]

| | |
|---|---|
| 343.25 | 778.2[106] |
| 342.05 | 761.2[106] |
| 341.70 | 757.3[106] |
| 341.57 | 756.4[106] |
| 340.6 | 742.2[104] |
| 340.5 | 742.2[104] |
| 340.58 | 738.9[106] |
| 337.70 | 697.6[106] |
| 337.14 | 692.7[106] |
| 335.52 | 674.4[106] |
| 329.47 | 612.2[106] |
| 328.0 | 584.0[104] |
| 327.9 | 583.4[104] |
| 327.4 | 577.4[104] |
| 325.47 | 555.5[106] |
| 321.29 | 515.0[106] |
| 320 | 502.9[36] |
| 318.20 | 488.1[106] |
| 313.4 | 437.0[104] |
| 313.2 | 436.2[104] |
| 312.8 | 432.9[104] |
| 310.31 | 415.6[106] |
| 304.35 | 363.9[106] |
| 300.6 | 334.2[104] |
| 300 | 332.0[36] |
| 300.1 | 331.3[104] |
| 299.9 | 330.4[104] |
| 298.22 | 319.1[106] |
| 297.38 | 317.7[106] |
| 295.37 | 303.0[106] |
| 292.15 | 279.0[106] |
| 286.66 | 247.7[106] |
| 282.1 | 219.8[104] |
| 282.0 | 219.6[104] |
| 280 | 211.0[36] |
| 277.50 | 203.2[106] |
| 277.66 | 198.2[106] |
| 271.75 | 175[106] |
| 270.70 | 169.3[106] |
| 263.74 | 142.5[106] |
| 261.76 | 135.5[106] |
| 260.3 | 130.2[104] |
| 259.50 | 129.5[106] |
| 260 | 129.1[36] |
| 259.8 | 128.3[104] |
| 259.4 | 127.3[104] |
| 254.86 | 113.4[106] |
| 244.6 | 86.5[104] |

| | |
|---|---|
| 244.59 | 86.5[106] |
| 244.4 | 85.9[104] |
| 240 | 76.0[36] |
| 236.64 | 69.6[106] |
| 232.12 | 62.1[106] |
| 231.94 | 60.2[106] |
| 228.0 | 55.0[104] |
| 227.77 | 52.7[106] |
| 226.53 | 52.7[106] |
| 223.2 | 48.0[104] |

$D_4^{20}$

| | |
|---|---|
| 1.242 (solid)[120] | |
| 1.244 (solid)[105] | |
| 1.250[14] | |
| 1.252[14] | |
| 1.26[126] | |
| 0.9457 | 254.7° [92] |
| 0.9456 | 254.3° [92] |
| 0.9516 | 246.5° [92] |
| 1.250 | 27° [109] |
| $1.2477_6$ | 25.00° [99] |
| 1.252 | 25° [68] |
| 1.253 | 25° [68] |
| 1.252 | 22° [19] |
| 1.251 | 17° [14] |
| 1.303 | −195° [19] |

$n_D^{20}$

| | |
|---|---|
| 1.59480 | 90.35° [135] |

Additional Data

$$\frac{1}{T_b} = 0.0025640 - 0.0003252 \log_{10} p_{mm}$$
(100 to 780mm)

(a) The melting point 217 is found in references 31, 56, 61, 62, 69, 118, 119, 129, 139.

(b) The melting point 216 is found in references 17, 70, 72, 90, 91, 96, 108, 110, 111, 127.

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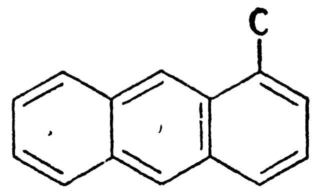
## $C_{15}H_{12}$

### 1-Methylanthracene



M. P., °C
- 86[132]
- 85–86[47, 48, 49, 65, 77]
- 83–85[89]

$D_4^{20}$

| | |
|---|---|
| 1.0471 | 99.4° [76, 77] |

$n_D^{20}$

| | |
|---|---|
| 1.68027 | 99.4° [76, 77] |
| 1.66692 | $n_{H\alpha}^{99.4}$ [76, 77] |
| 1.72106 | $n_{H\beta}^{99.4}$ [76, 77] |

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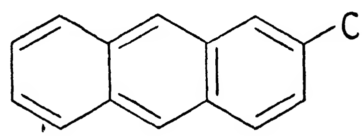
### 2-Methylanthracene



M. P., °C
- **206.5**
- 208–210[137]
- 209–209.5[94]
- 207–207.5[72]
- 207 (a)
- 206–207[122]
- 205–207[75]
- 205[142]
- 204–205[74]
- 204.5[82]
- 204[115]
- 203–204[47, 55, 71]
- 202–204[21, 22]
- 203[20, 70, 98]
- 202–203[64]
- 202[29, 34, 115, 133, 134]

B. P., °C @ 760mm
- 293–297[46]

(a) The melting point 207 is found in references 35, 45, 73, 76, 87, 89, 102, 141.

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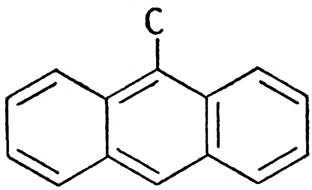
**9-Methylanthracene**



M. P., °C

81.5[125]
79–80[76, 78]
78–79[4]
76.3–77.8[43]

$D_4^{20}$

| | |
|---|---|
| 1.0657 | 99.4° [76] |

$n_D^{20}$

| | |
|---|---|
| 1.69589 | 99.4° [76] |
| 1.68166 | $n_{H\alpha}^{99.4}$ [76] |
| 1.74075 | $n_{H\beta}^{99.4}$ [76] |

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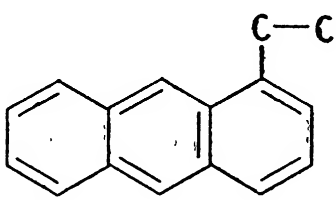
## $C_{16}H_{14}$

**1-Ethylanthracene**



M. P., °C

33–34[138]

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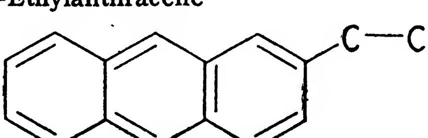
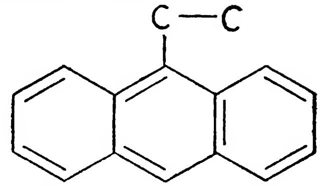
**2-Ethylanthracene**



M. P., °C

150–151[138]

**9-Ethylanthracene**



M. P., °C

60–61[84, 85]
59[76, 77, 78, 125]
56–58[43]

$D_4^{20}$

| | |
|---|---|
| 1.0413 | 99.2° [76, 77] |

$n_D^{20}$

| | |
|---|---|
| 1.67621 | 99.2° [76, 77] |
| 1.66282 | $n_{H\alpha}^{99.2}$ [76, 77] |
| 1.71845 | $n_{H\beta}^{99.2}$ [76, 77] |

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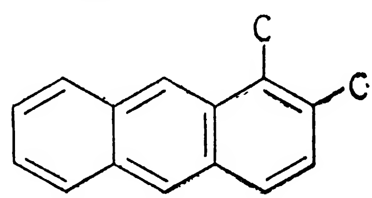
**1,2-Dimethylanthracene**



M. P., °C

85.5–86[7]

B. P., °C @ 760mm

| | |
|---|---|
| 180 | 0.4[7] |

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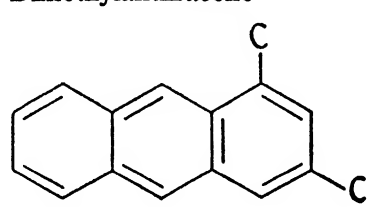
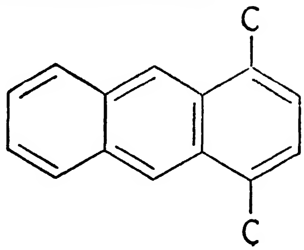
**1,3-Dimethylanthracene**



M. P., °C

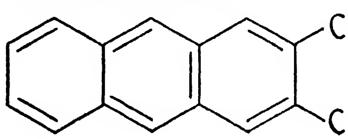
204[38]
202–203[55, 86]
202[71]
200[130]

**1,4-Dimethylanthracene**



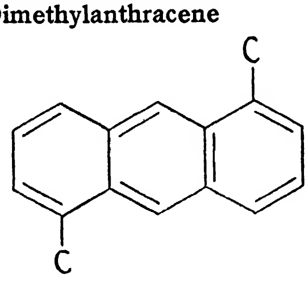
M. P., °C
76[11]
74[132]
71[88]

**2,3-Dimethylanthracene**



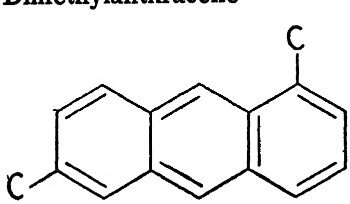
M. P., °C
252[12, 102]
246[38, 40]
244–246[24]

**1,5-Dimethylanthracene**



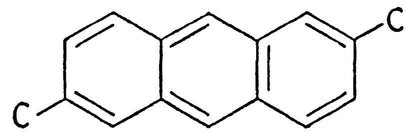
M. P., °C
139–140[58]

**1,6-Dimethylanthracene**



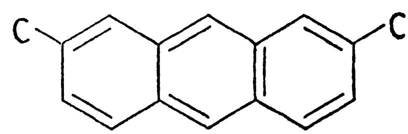
M. P., °C
240[22, 30, 82, 83]

**2,6-Dimethylanthracene**



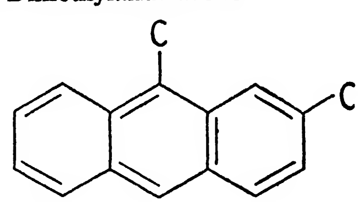
M. P., °C
**245**
250[100]
248[102]
243[6, 123]
242–243[50]

**2,7-Dimethylanthracene**



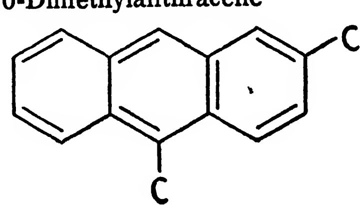
M. P., °C
**242**
244.5[82, 83]
243–244[2, 81]
241[100]
239[102]
235[73]

**2,9-Dimethylanthracene**



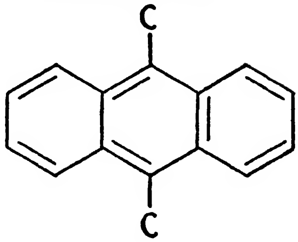
M. P., °C
85[8]

**2,10-Dimethylanthracene**



M. P., °C
85[8]

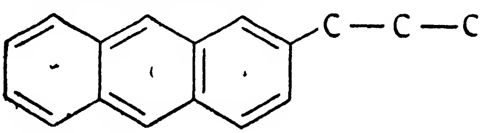
**9,10-Dimethylanthracene**



M. P., °C
**181**
182.8–183.8[16]
181–181.5[79]
181[13]
180.5–181[3]
180–181[54]

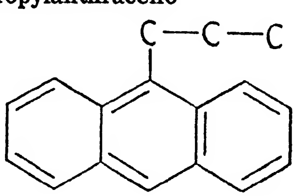
$C_{17}H_{16}$

**2-*n*-Propylanthracene**



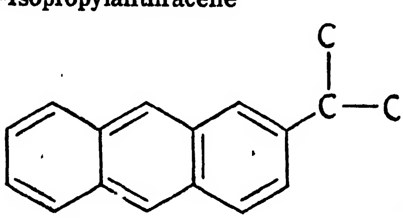
M. P., °C
126[138]

**9-*n*-Propylanthracene**



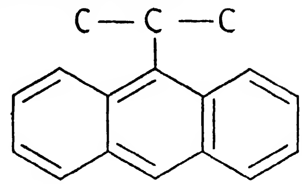
M. P., °C
69–70[125]

**2-Isopropylanthracene**



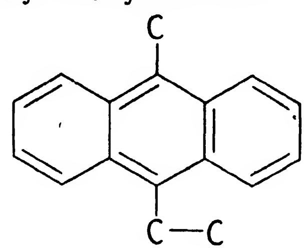
M. P., °C
154–155[138]

**9-Isopropylanthracene**



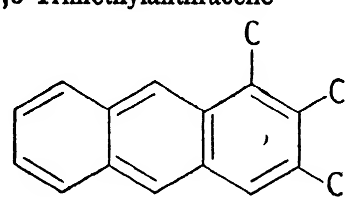
M. P., °C
76[13]

**9-Methyl-10-ethylanthracene**



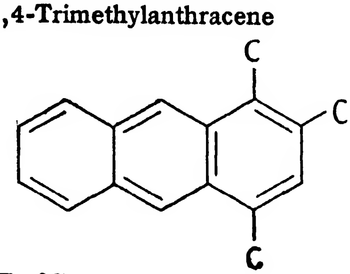
M. P., °C
144[145]
143.2–144[16]
143–144[144]

**1,2,3-Trimethylanthracene**



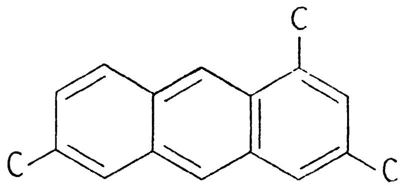
M. P., °C
243[143]
236[143]

**1,2,4-Trimethylanthracene**



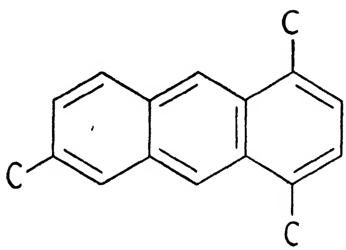
M. P., °C
244[39]
243[55, 102]
236[86]

**1,3,6-Trimethylanthracene**



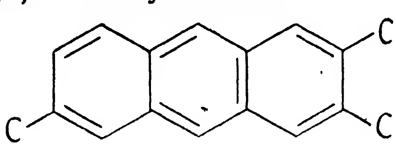
M. P., °C
222[39, 102]

**1,4,6-Trimethylanthracene**



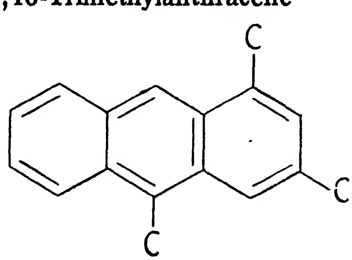
M. P., °C
227[37, 39, 41, 102]

**2,3,6-Trimethylanthracene**



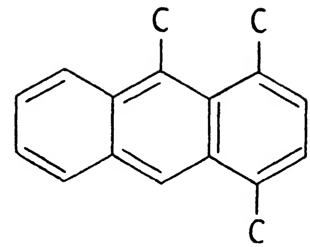
M. P., °C
255[101]
252[102]

**1,3,10-Trimethylanthracene**



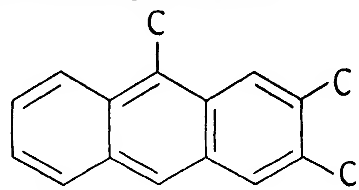
M. P., °C
100[10]

**1,4,9-Trimethylanthracene**



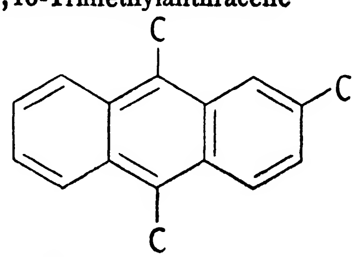
M. P., °C
81[11]

**2,3,9-Trimethylanthracene**



M. P., °C
125[12]

**2,9,10-Trimethylanthracene**

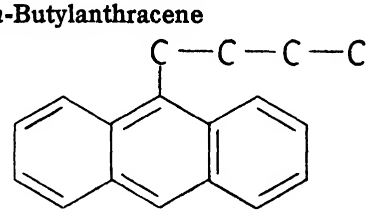


M. P., °C
100–101 (a)[3]
95–96 (a)[3]

(a) These constants were determined on different crystalline forms.

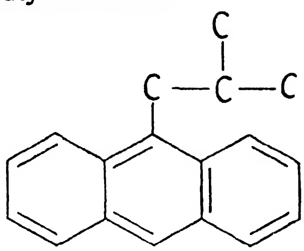
**$C_{18}H_{18}$**

**9-*n*-Butylanthracene**



M. P., °C
57[85]
49–50[125]

**9-Isobutylanthracene**



M. P., °C
57[84]

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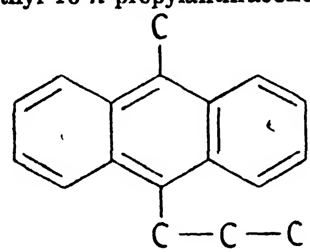
**9-Methyl-10-*n*-propylanthracene**



M. P., °C
97.8–98.6[16]

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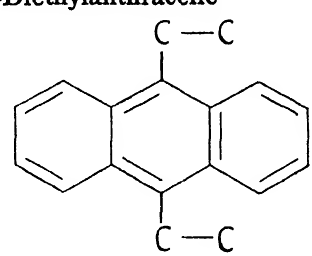
**9,10-Diethylanthracene**



M. P., °C
146–147[3]
146[107]
145.5[60]

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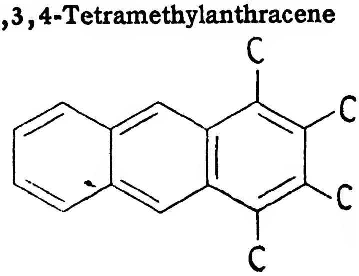
**1,2,3,4-Tetramethylanthracene**



M. P., °C
135.5–136.5[59]

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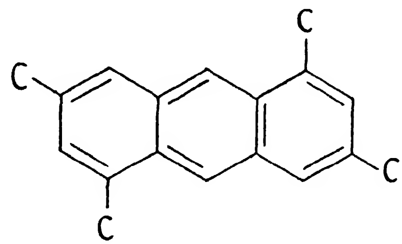
**1,3,5,7-Tetramethylanthracene**



M. P., °C
163–164[124]
162–163[52]

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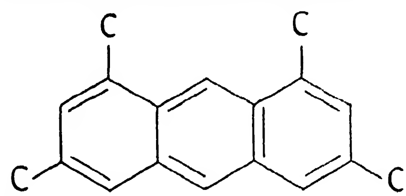
**1,3,6,8-Tetramethylanthracene**



M. P., °C
286–287[51]
281–283[124]
280[1, 32, 33]

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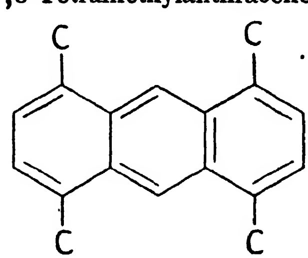
**1,4,5,8-Tetramethylanthracene**



M. P., °C
270[42]

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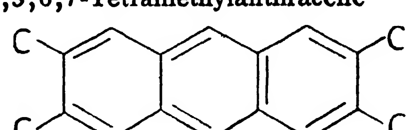
**2,3,6,7-Tetramethylanthracene**



M. P., °C
304[42]
301[102]
299[9]

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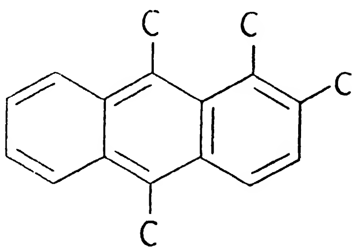
**1,2,9,10-Tetramethylanthracene**



M. P., °C
52–54[121]

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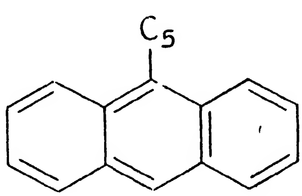
$C_{19}H_{20}$

**9-Pentylanthracene** (a)



M. P., °C
61[76, 78]
59[84, 85]
58–59[53]
58[131]

$D_4^{20}$

| | |
|---|---|
| 0.9812 | 99.4° [76] |
| 0.9982 | 76.5° [131] |
| 0.9987 | 74.4° [131] |
| 1.0017 | 71.1° [131] |

$n_D^{20}$

| | |
|---|---|
| 1.62529 | 99.4° [76] |
| 1.63475 | 76.5° [131] |
| 1.63636 | 71.1° [131] |
| 1.61423 | $n_{H\alpha}^{99.4}$ [76] |
| 1.62353 | $n_{H\alpha}^{76.5}$ [131] |
| 1.62491 | $n_{H\alpha}^{71.1}$ [131] |
| 1.66023 | $n_{H\beta}^{99.4}$ [76] |
| 1.67008 | $n_{H\beta}^{76.5}$ [131] |
| 1.67152 | $n_{H\beta}^{71.1}$ [131] |

(a) This compound was named *Iso*-amylanthracene in references 53, 76, 78, 131.

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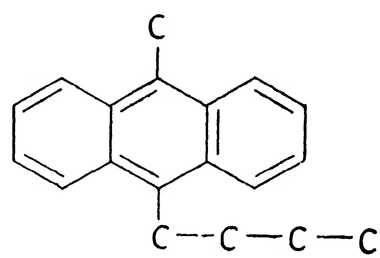
**9-Methyl-10-*n*-butylanthracene**



M. P., °C
78.2–78.8[16]

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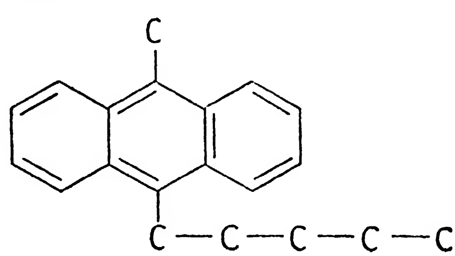
$C_{20}H_{22}$

**9-Methyl-10-*n*-pentylanthracene**



M. P., °C
71–71.8[16]

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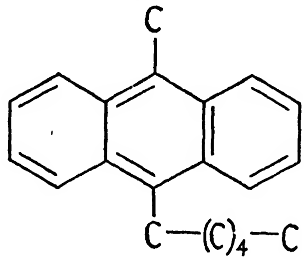
**Diisopropylanthracene** (a)

B. P., °C @ 760mm
202–206 0.2[27]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{21}H_{24}$

**9-Methyl-10-*n*-hexylanthracene**



M. P., °C
65.8–66.5[16]

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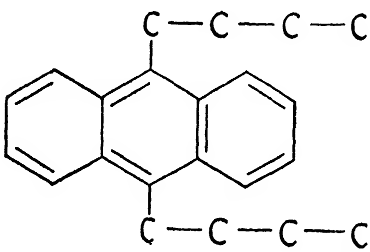
## $C_{22}H_{26}$

**9,10-Di-*n*-butylanthracene**



M. P., °C
105–106[60]

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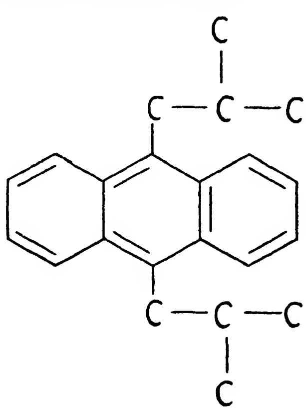
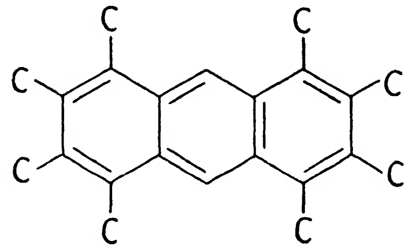
**9,10-Diisobutylanthracene**



M. P., °C
137–138[80, 93]
132–133[60, 93]

**1,2,3,4,5,6,7,8-Octamethylanthracene**



M. P., °C
299–300[5]

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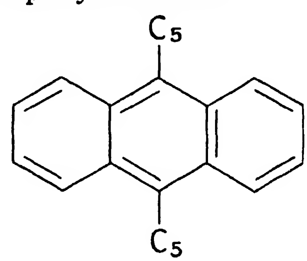
## $C_{24}H_{30}$

**9,10-Dipentylanthracene**



M. P., °C
132–137[63]
134.5–135 (a)[60]

(a) This compound was named Di*iso*amylanthracene.

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## $C_{26}H_{34}$

**x,x-Di-(ethylbutyl)-anthracene** (a)

B. P., °C @ 760mm
240–256 3[27]

(a) The structure of this compound was not clearly defined in the literature.

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## $C_{54}H_{90}$

**$x_5$-Penta-(diethylbutyl)-anthracene** (a)

M. P., °C
89.2–101[27]

(a) The structure of this compound was not clearly defined in the literature.

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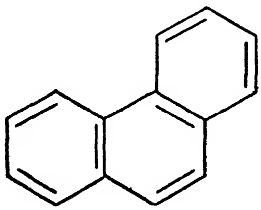
## 3. PHENANTHRENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-18}$

### $C_{14}H_{10}$

**Phenanthrene**



M. P., °C

**100 .3**
103.5[59]
103.05[105]
103.0[59]
103[60, 75]
102.5–103[51]
101–102[118]
101[17, 18, 48, 53]
100.7–101[32]
100–101[107]
100.0–100.9[24]
100.5[113]
100.4[119]
100.35[126]
100.3[122]
100(a)
99.6–100[66]
99 5–100[137]
99–100(b)
99.8[22]
99.6[132]
99.5[67, 101]
99–99.5[23, 79]
98.8–99.5[89]
98.7–99.5[1]
98.5–99.5[5]
99.0[30]
99 (c)
98–99[55, 83, 114, 115, 124, 125]
98.8[100]
98.2–98.8[103]
98.5[57, 94, 97]
98.0[82]
98[15, 29, 88, 133]
97.5–98[35, 52]
97–98[2, 19, 20, 27, 33, 72]
97.8[80]
97.7[49]
97–97.5[131]
96.5–97.5[38]
97.3[13]
97.2[10]
96–97[20, 34, 92]
96.3[99]
96.25[37, 89]
96.2[74]
96.1[121]
96[45, 56, 68, 93, 130]
95–96[129]
95.85[78]
95.57[12]

B. P., °C @ 760mm

**339 .6**
340 (d)
338.5[82]
337.8[81]

| | |
|---|---|
| 346.8 | 883.9[82] |
| 345.7 | 870.9[82] |
| 345.1 | 864.4[82] |
| 340.59 | 764.2[86] |
| 340.41 | 762.3[86] |
| 339.91 | 754.3[86] |
| 337.1 | 741.0[82] |
| 333.08 | 664.6[86] |
| 332.11 | 654.4[86] |
| 330 | 629.4[28] |
| 325.4 | 592.6[82] |
| 324.9 | 588.7[82] |
| 324.5 | 584.7[82] |
| 321.24 | 531.5[86] |
| 320 | 518.8[28] |
| 319.27 | 510.7[86] |
| 312.62 | 446.0[86] |
| 309.44 | 420.3[86] |
| 308.64 | 414.8[86] |
| 306.5 | 399.7[82] |

| | |
|---|---|
| 306.4 | 399.2[82] |
| 300.91 | 350.9[86] |
| 300 | 343.7[28] |
| 299.88 | 340.2[86] |
| 295.37 | 311.4[86] |
| 294.57 | 307.4[86] |
| 293.2 | 299.9[82] |
| 293.2 | 299.8[82] |
| 293.1 | 299.7[82] |
| 282.73 | 234.1[86] |
| 281.33 | 226.1[86] |
| 280 | 220.0[28] |
| 271.5 | 183.0[82] |
| 271.5 | 182.9[82] |
| 269.89 | 172.4[86] |
| 264.73 | 151.4[86] |
| 260 | 135.5[28] |
| 249.14 | 101.5[86] |
| 246.1 | 94.6[82] |
| 246.59 | 94.5[86] |
| 246.0 | 94.3[82] |
| 240 | 79.0[28] |
| 233.8 | 67.5[82] |
| 233.54 | 65.4[86] |
| 232.34 | 62.2[86] |
| 203.6 | 27.2[82] |

$D_4^{20}$

| | |
|---|---|
| 1.172 (solid)[61] | |
| 1.174 (solid)[84] | |
| 1.175 (solid)[47] | |
| 1.182 (solid)[106] | |
| 1.018 | 170°[110] |
| 1.031 | 150°[110] |
| 1.030 | 149.8°[111] |
| 1.0412 | 131.1°[63] |
| 1.046 | 130°[110] |
| 1.046 | 129.8°[111] |
| 1.058 | 110°[110] |
| 1.0630 | 100.5°[113] |
| 1.058 | 99.8°[111] |
| 1.0395 | 97.03°[12] |
| 1.0418 | 93.53°[12] |
| 1.0459 | 89.43°[12] |
| 1.0483 | 85.93°[12] |
| 1.0514 | 81.82°[12] |
| 1.0540 | 78.32°[12] |
| 1.0590 | 71.62°[12] |
| 1.0620 | 67.53°[12] |
| 1.0671 | 60.83°[12] |
| 1.0688 | 57.33°[12] |
| 1.1648 (solid) | 47.12°[12] |
| 1.1752 (solid) | 28.91°[12] |
| 1.179 | 25°[62] |
| 1.1816 (solid) | 19.46°[12] |

$n_D^{20}$

| | |
|---|---|
| 1.629 | 170°[110] |
| $1.639_5$ | 150°[110] |
| 1.6395 | 149.8°[111] |
| 1.650 | 130°[110] |
| 1.6502 | 129.8°[111] |
| 1.65671 | 129.6°[63] |
| 1.660 | 110°[110] |
| 1.6600 | 99.8°[111] |
| 1.64646 | $n_{H\alpha}^{130.6}$[63] |

(e)

Additional Data

$$\frac{1}{T_b} = 0.0025694 - 0.0003254 \log_{10} p_{mm}$$

(100 to 885mm)

(a) The melting point 100 is found in references 3, 4, 11, 14, 16, 18, 21, 40, 41, 43, 44, 46, 64, 70, 77, 86, 87, 90, 95, 96, 98, 102, 108, 109, 112, 114, 115, 120, 128.

(b) The melting point 99–100 is found in references 7, 25, 36, 50, 71, 116, 134, 136.

(c) The melting point 99 is found in references 8, 9, 26, 31, 37, 42, 58, 69, 73, 76, 91, 104, 117, 119, 134, 135, 136.

(d) The boiling point 340 is found in references 6, 16, 38, 54, 65, 69, 117, 123, 127, 129, 130.

(e) Refractive indices at other lines are found in reference 85.

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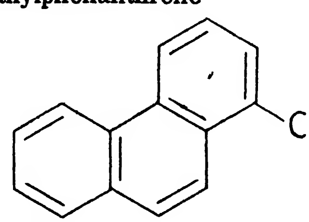
$C_{15}H_{12}$

## 1-Methylphenanthrene



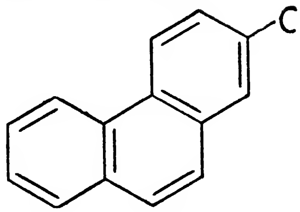

M. P., °C

**121.3**
123.5[32]
123[100]
122–122.5[56]
120–121[9]
120[54]
119–120[28, 53]
119[68, 82]
118[57, 59]

B. P., °C @ 760mm

354–355 763[82]

**2-Methylphenanthrene**



M. P., °C

**55.3**

56–56.5[93]

56[95]

55–56[31, 57, 124]

54–55[11]

53[83]

52–53[76]

B. P., °C @ 760mm

155–160 3[95]

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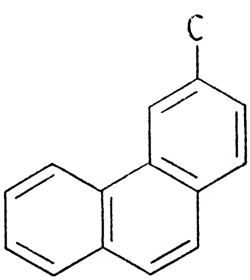
**3-Methylphenanthrene**



M. P., °C

85[124]

65[82, 100]

62–63[57]

61–62[5]

B. P., °C @ 760mm

350 769[82]

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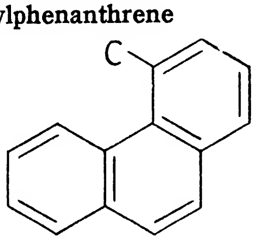
**4-Methylphenanthrene**



M. P., °C

117[103]

116[34]

49–50[57, 67]

B. P., °C @ 760mm

160 2[34]

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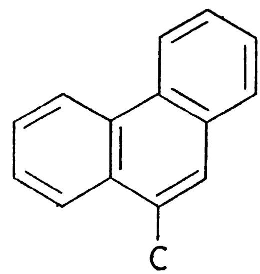
**9-Methylphenanthrene**



M. P., °C

**94**

99.5[17]

94[142]

91.5–92.5[26]

92[82]

91–92[86]

90–91[4, 62, 84, 139]

88–89[138]

88[140]

B. P., °C @ 760mm

354–355[82]

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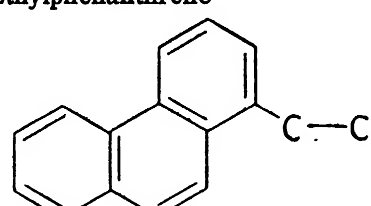
$C_{16}H_{14}$

**1-Ethylphenanthrene**



M. P., °C

109–110[101]

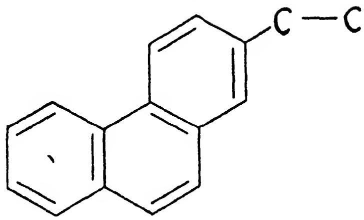
108[52]

63.5–64.0[9]

62–63[55]

62.5[64]

**2-Ethylphenanthrene**



M. P., °C
172–173[101]
67–68[91]
65–66[6]
64–65[63]

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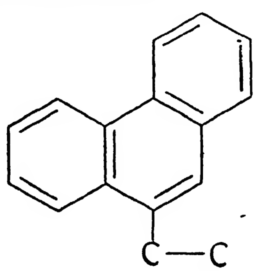
**9-Ethylphenanthrene**



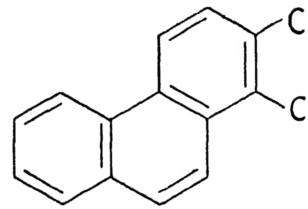
M. P., °C
63
66[16]
63.5–64.5[8]
62.5–63[91]
61–63[102]
61[137]
58–60[86]

B. P., °C @ 760mm
220[15]
198–200 11[102]

$D_4^{20}$
1.0603 77.5°[81]

$n_D^{20}$
1.65818 77.5°[81]
1.64834 $n_{H\alpha}^{77.5}$[81]
1.68588 $n_{H\beta}^{77.5}$[81]

**1,2-Dimethylphenanthrene**



M. P., °C
142–143[64]
140[29]
139–140[13]

B. P., °C @ 760mm
115–120 2[18]

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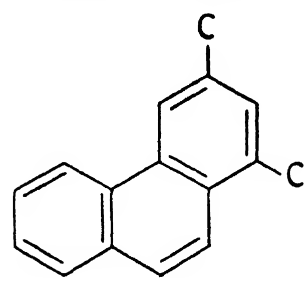
**1,3-Dimethylphenanthrene**



M. P., °C
76–77[24]
75–76[64]

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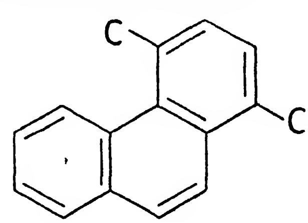
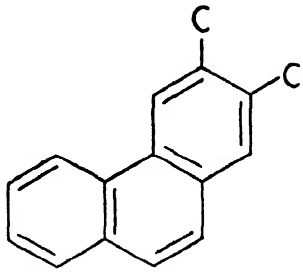
**1,4-Dimethylphenanthrene**



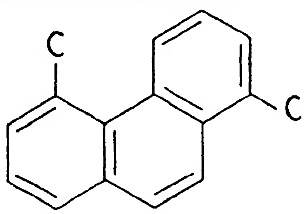
M. P., °C
77[11]
50–51[2]
49.5–50.0[99]

**2,3-Dimethylphenanthrene**



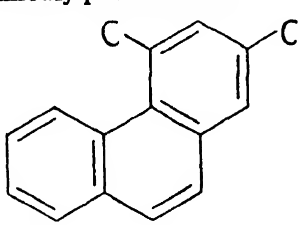
M. P., °C
79–80[65]
78–78.5[48, 50]
77–78[49]
65–66[64]

**1,5-Dimethylphenanthrene**



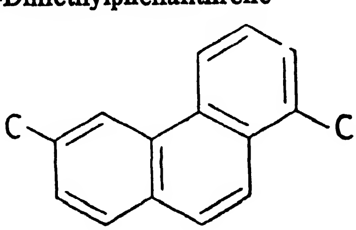
M. P., °C
57–58[64]

**2,4-Dimethylphenanthrene**



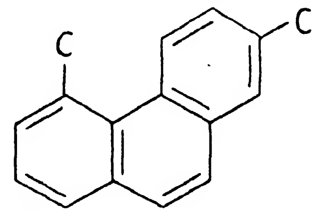
M. P., °C
111[64]

**1,6-Dimethylphenanthrene**



M. P., °C
87–88[64]

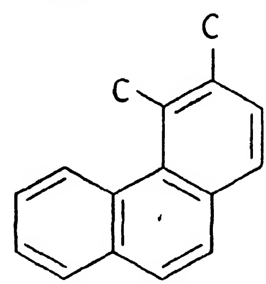
**2,5-Dimethylphenanthrene**



M. P., °C
46–47[64]

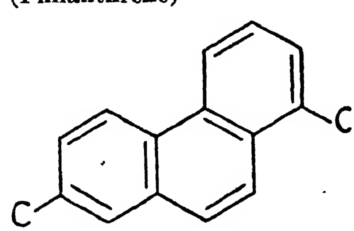
B. P., °C @ 760mm
204–205 15[64]

**3,4-Dimethylphenanthrene**



M. P., °C
62–63[64]

**1,7-Dimethylphenanthrene**
(Pimanthrene)



M. P., °C
85.7
86[11, 27, 114, 119, 120]
85–86[28, 61, 106]
85[75]
79–81[70]
45[88]

B. P., °C @ 760mm

| | |
|---|---|
| 340[88] | |
| 190 | 0.2[118] |
| 158–160 | 0.1[69] |

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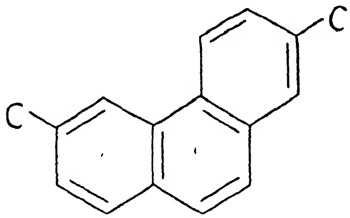
**2,6-Dimethylphenanthrene**



M. P., °C
33–34[64]

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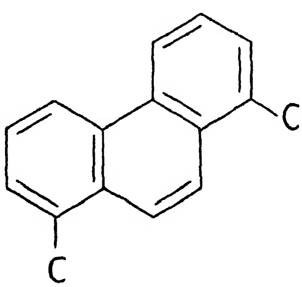
**1,8-Dimethylphenanthrene**



M. P., °C
191–192[64]

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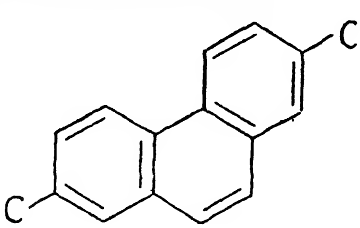
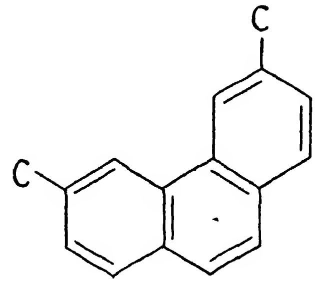
**2,7-Dimethylphenanthrene**



M. P., °C
101–102[64]

**3,6-Dimethylphenanthrene**



M. P., °C
141[64]

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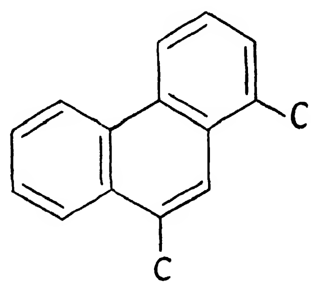
**1,9-Dimethylphenanthrene**



M. P., °C
88[35]
87–88[62]

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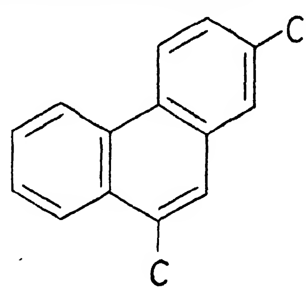
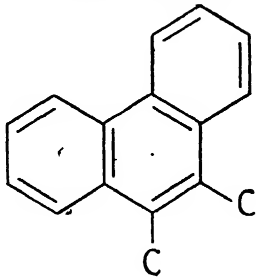
**2,9-Dimethylphenanthrene**



M. P., °C
56–57[64]
55–56[124]

**9,10-Dimethylphenanthrene**



M. P., °C
142.5–143[25A]
139[143]

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**x,x-Dimethylphenanthrene** (a)

M. P., °C
126–127[46]

(a) The structure of this compound was not clearly defined in the literature.

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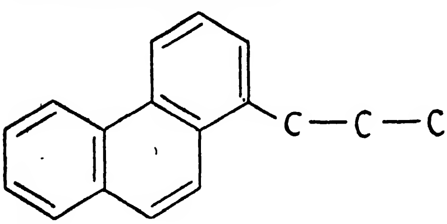
**$C_{17}H_{16}$**

**1-*n*-Propylphenanthrene**



M. P., °C
34–35[64]
32–33[9]

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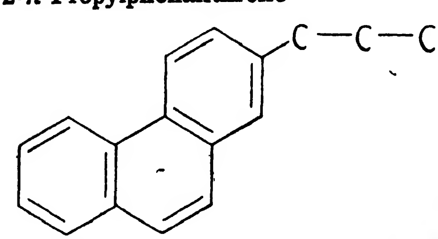
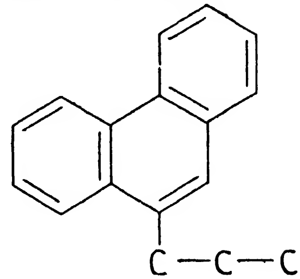
**2-*n*-Propylphenanthrene**



M. P., °C
35–36[7]

**9-*n*-Propylphenanthrene**



M. P., °C
74[89]
58.5–59.5[6]
59[3]

B. P., °C @ 760mm
265–270 22[89]

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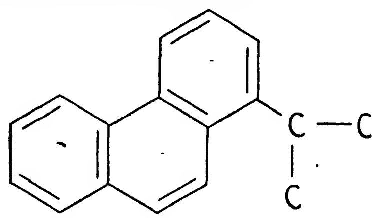
**1-Isopropylphenanthrene**



M. P., °C
88–88.5[9]
85–86[64]

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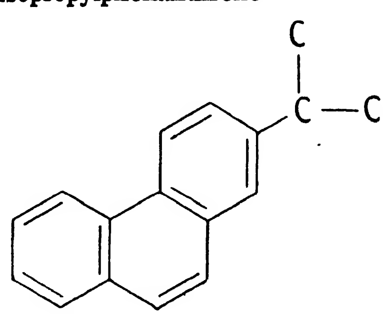
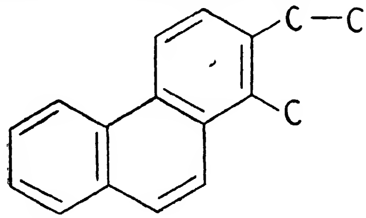
**2-Isopropylphenanthrene**



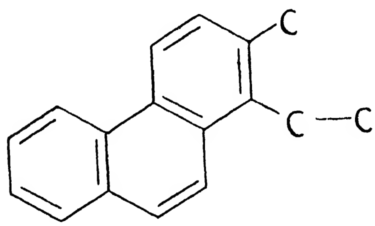
M. P., °C
44–45[64]

**1-Methyl-2-ethylphenanthrene**



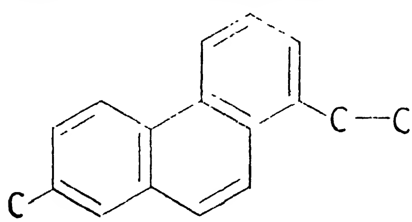
M. P., °C
100[64]

**1-Ethyl-2-methylphenanthrene**



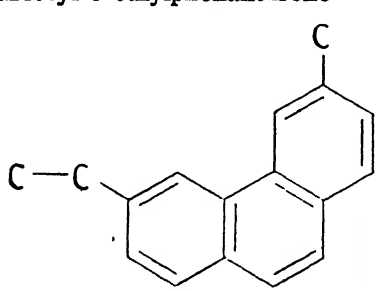
M. P., °C
80[64]

**1-Ethyl-7-methylphenanthrene**



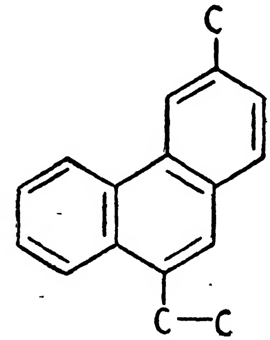
M. P., °C
81[58]
80–81[109]

**3-Methyl-6-ethylphenanthrene**



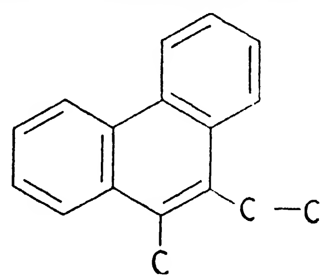
M. P., °C
47–48[5]

**3-Methyl-9-ethylphenanthrene**



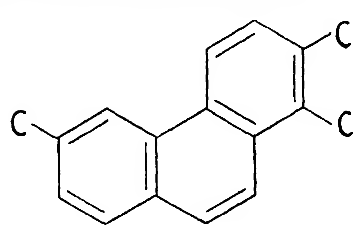
M. P., °C
47–48[5]

**9-Methyl-10-ethylphenanthrene**



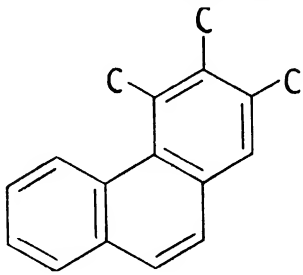
M. P., °C
85[25]

**1,2,6-Trimethylphenanthrene**



M. P., °C
128.5–129[111]
128–129[113]

**2,3,4-Trimethylphenanthrene**



M. P., °C
62.8–63.8[47]

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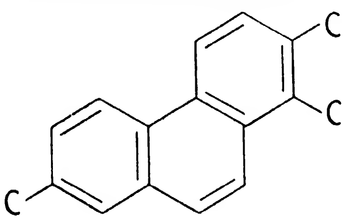
**1,2,7-Trimethylphenanthrene**



M. P., °C
120–121[60]

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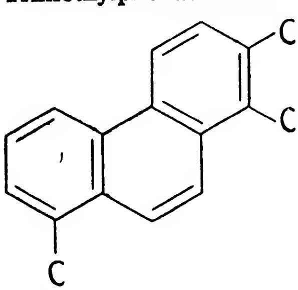
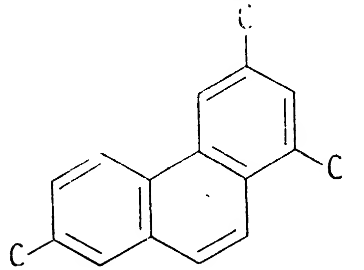
**1,2,8-Trimethylphenanthrene**



M. P., °C
144
212–213[122]
146–147[112]
144–145[62, 106]
144[71]
142–143[108]
141–142[38]

| B. P., °C @ 760mm | |
|---|---|
| 175–180 | 0.5[71] |
| 160–165 | 0.2[108] |

**1,3,7-Trimethylphenanthrene**



M. P., °C
68–69[60]

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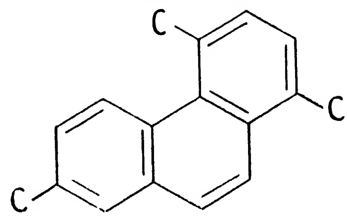
**1,4,7-Trimethylphenanthrene**



M. P., °C
72–73[61]

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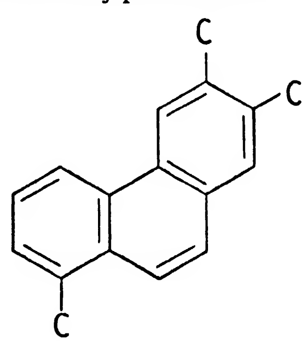
**2,3,8-Trimethylphenanthrene**



M. P., °C
123–124[60]

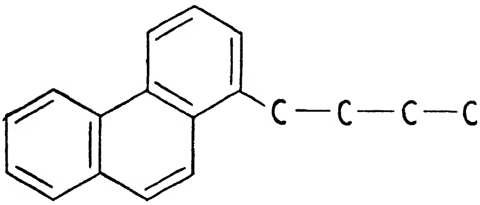
---

**x,x,x-Trimethylphenanthrene** (a)
M. P., °C
81[105]

(a) The structure of this compound was not clearly defined in the literature.

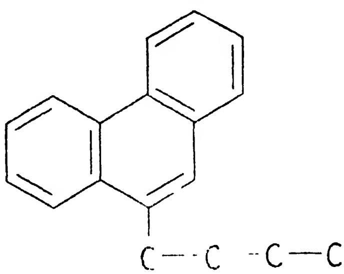
## $C_{18}H_{18}$

### 1-*n*-Butylphenanthrene




M. P., °C
42[9]

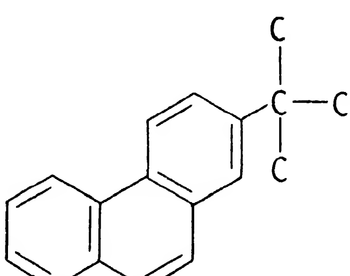
### 9-*n*-Butylphenanthrene




M. P., °C
78.5–79[3]
58[89]

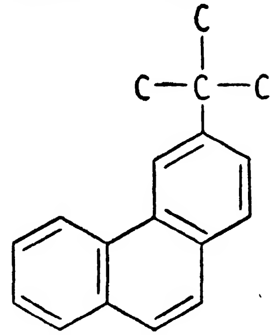
B. P., °C @ 760mm
282–284 20[89]

### 2-*tert*-Butylphenanthrene



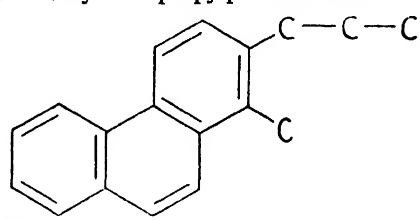
M. P., °C
99–100[51]

### 3-*tert*-Butylphenanthrene



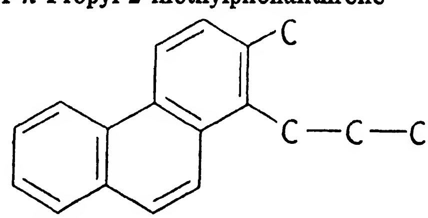
M. P., °C
54–55[51]

### 1-Methyl-2-*n*-propylphenanthrene



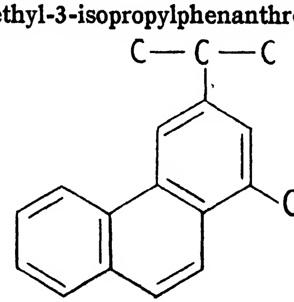

M. P., °C
54[78]

### 1-*n*-Propyl-2-methylphenanthrene




M. P., °C
65[31]

### 1-Methyl-3-isopropylphenanthrene



M. P., °C
79[33]

B. P., °C @ 760mm

| | |
|---|---|
| 18 | 1.5[33] |

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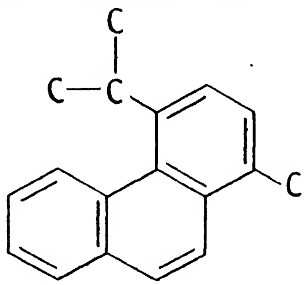
**1-Methyl-4-isopropylphenanthrene**



M. P., °C
68–68.5[24]

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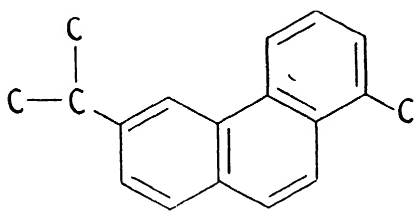
**1-Methyl-6-isopropylphenanthrene** (a)
(Isoretene)



M. P., °C
86–87[14]

(a) The structure of this compound was not clearly defined in the literature.

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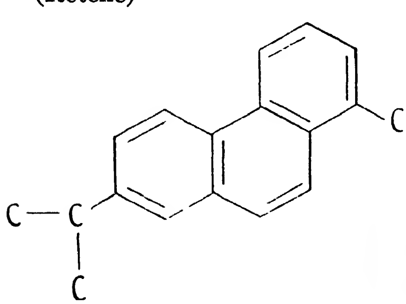
**1-Methyl-7-isopropylphenanthrene**
(Retene)



M. P., °C

**98.5**
100.5–101[115]
100.5[73]
100[126]
99[40, 116, 128]
98.5–99[23, 90, 121]
98–99 (a)
97–99[39, 74]
98.2–98.8[43]
98.5 (b)
98 (c)
97–98[72]
97.5[87]
96[27, 87, 45]
95.2[41, 42]
95[19, 20, 21, 131, 141]

B. P., °C @ 760mm

| | |
|---|---|
| **394** | |
| 400[131] | |
| 394[123] | |
| 390–393[93] | |
| 390[22] | |
| 216 | 11[133] |
| 208–210 | 10[1, 134] |
| 135 | 0[80] |

$D_4^{20}$

| | |
|---|---|
| 1.063 | 98.2–98.8° [43] |
| 1.077 | 98.2–98.8° [43] |
| 1.067 (solid) | 90° [43] |
| 1.093 (solid) | 90° [43] |
| 1.0841 | 25.6° [135] |
| 1.0908 | 17.5° [135] |

$n_D^{20}$

| | |
|---|---|
| 1.61783 | $n_{H\alpha}^{25.6}$ [135] |
| 1.62132 | $n_{H\alpha}^{17.5}$ [135] |
| 1.64921 | $n_{H\beta}^{25.6}$ [135] |
| 1.65286 | $n_{H\beta}^{17.5}$ [135] |
| 1.62662 | $n_{He}^{25.6}$ [135] |
| 1.63009 | $n_{He}^{17.5}$ [135] |

(a) The melting point 98–99 is found in references 12, 30, 61, 74, 77, 79, 85, 110, 132, 136.

(b) The melting point 98.5 is found in references 1, 10, 24, 44, 134, 135.

(c) The melting point 98 is found in references 28, 92, 96, 97, 117, 120, 125, 129, 133.

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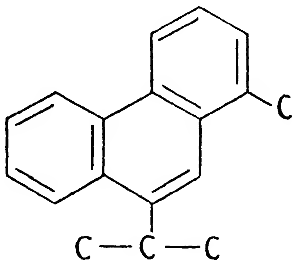
**1-Methyl-9-isopropylphenanthrene**



B. P., °C @ 760mm

204–205 14[36]

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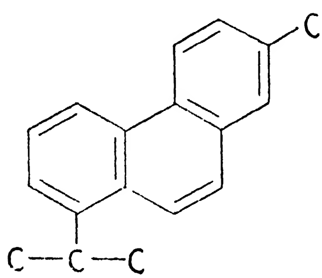
**2-Methyl-8-isopropylphenanthrene**
(Scianthrene)



M. P., °C

86–87[130]

82–83[94]

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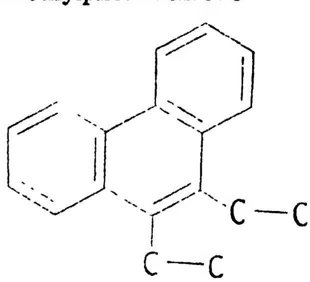
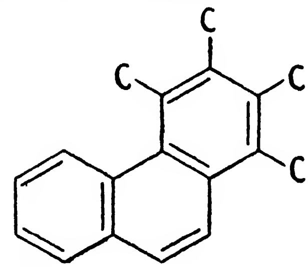
**9,10-Diethylphenanthrene**



M. P., °C

90–91[137]

**1,2,3,4-Tetramethylphenanthrene**



M. P., °C

92–93[66]

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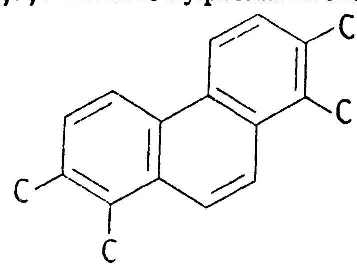
**1,2,7,8-Tetramethylphenanthrene**



M. P., °C

126–127[107]

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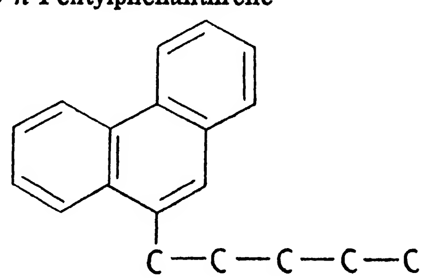
**$C_{19}H_{20}$**

**9-*n*-Pentylphenanthrene**



M. P., °C

69–70[25A]

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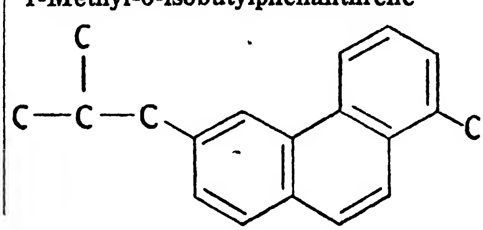
**1-Methyl-6-isobutylphenanthrene**



M. P., °C

49–50[104]

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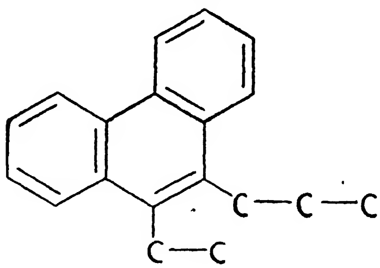
**9-Ethyl-10-*n*-propylphenanthrene**



M. P., °C

69[25]

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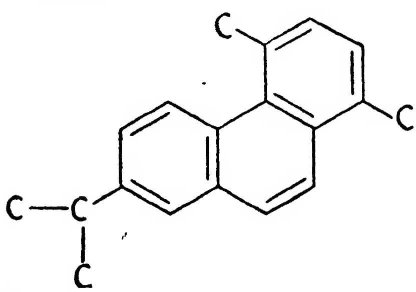
**1,4-Dimethyl-7-isopropylphenanthrene**



M. P., °C

61–62[61]

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**1,x-Dimethyl-7-isopropylphenanthrene** (a)
(Methylretene)

M. P., °C

81–82[109]
79[110]
78.5[127]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{20}H_{22}$

**1-Methyl-x-ethyl-7-isopropylphenanthrene** (a)

M. P., °C

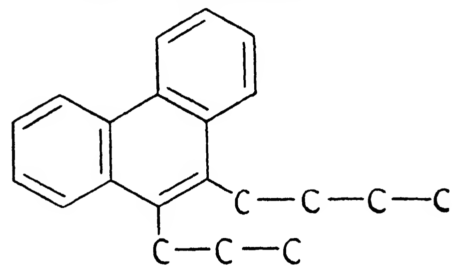
54–55[23]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{21}H_{24}$

**9-*n*-Propyl-10-*n*-butylphenanthrene**



M. P., °C

74[25]

---

**1-Methyl-7,x-diisopropylphenanthrene** (a)
(Isopropylretene)

M. P., °C

52–53[92]

B. P., °C @ 760mm

231–233 9.5[92]

$D_4^{20}$

1.0125[92]

(a) The structure of this compound was not clearly defined in the literature.

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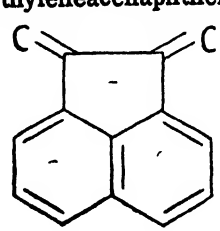
## 4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-18}$

### $C_{14}H_{10}$

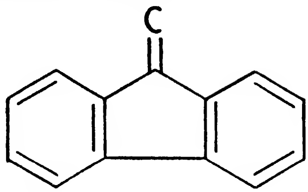
**1,2-Dimethyleneacenaphthene**



M. P., °C
184 (a)[41]
158 (b)[41]

(a) This constant was determined on the *trans* isomer of the compound.
(b) This constant was determined on the *cis* isomer of the compound.

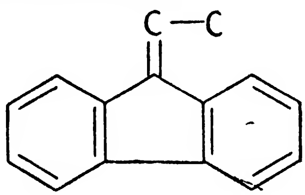
**9-Methylenefluorene**



M. P., °C
104–106[39]
53[23, 78]
46–48[59]

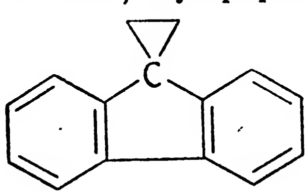
## $C_{15}H_{12}$

**9-Ethylidenefluorene**



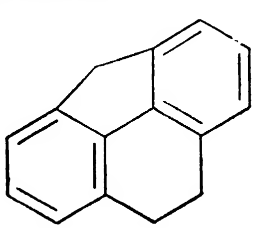
M. P., °C
104[18, 20, 64, 66, 67]
102[51]
100[42]

**Spiro[fluorene-9,1′-cyclopropane]**



M. P., °C
73–73.5[77]

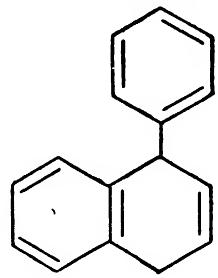
**Cyclopentano-[def]-9,10-dihydrophenanthrene**



M. P., °C
140.5–141.2[26]

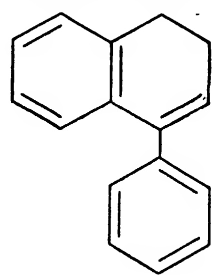
## $C_{16}H_{14}$

**1-Phenyl-1,4-dihydronaphthalene**



M. P., °C
50[63]

**4-Phenyl-1,2-dihydronaphthalene**

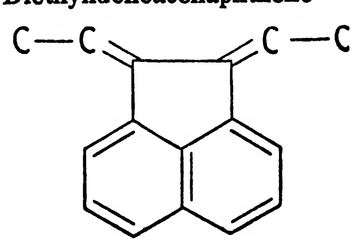


| B. P., °C @ 760mm | |
|---|---|
| 302[75] | |
| 175–177 | 12[76] |
| 186–188 | 10[68] |

$D_4^{20}$

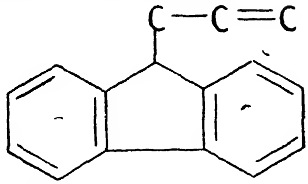
| | |
|---|---|
| 1.0784 | 27° [70] |

**1,2-Diethylideneacenaphthene**



M. P., °C
140[40]

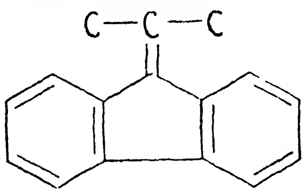
**9-(Propen-2′-yl)-fluorene**



B. P., °C @ 760mm

| | |
|---|---|
| 174–176 | 15[79] |

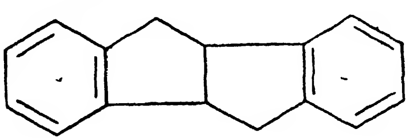
**9-Isopropylidenefluorene**



M. P., °C
113–117[30, 38]
113 (a)[55]
89 (a)[18]

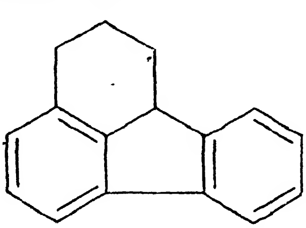
(a) These constants were determined on stereoisomers.

**2,3,6,7-Dibenzobicyclo-[3,3,0]-octane**



M. P., °C
102[5]
100[53]

**Cyclohexano-[jk]-fluorene**

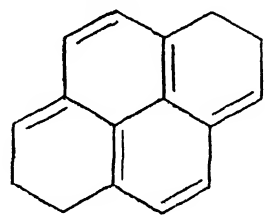


M. P., °C
75
76[36]
75[35]
74–75[74]
73–74[73]

B. P., °C @ 760mm

| | |
|---|---|
| 363–365 | 749[35] |
| 203–205 | 12[74] |
| 200–205 | 12[73] |
| 155 | 0.7[69] |

**1,2,6,7-Tetrahydropyrene**



M. P., °C
138[17]

**$x_4$-Tetrahydropyrene** (a)

M. P., °C
84[45]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{17}H_{16}$

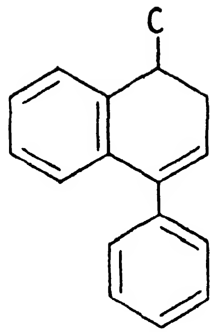
**x-Phenethenylindane** (a)

B. P., °C @ 760mm

| | |
|---|---|
| 198–201 | 18[60] |

(a) The structure of this compound was not clearly defined in the literature.

**1-Methyl-4-phenyl-1,2-dihydronaphthalene**



M. P., °C
48[70]
B. P., °C @ 760mm
185–188 14[70]
$D_4^{20}$
1.0513 22° [70]

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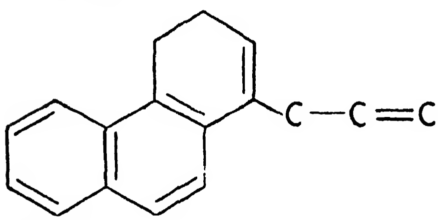
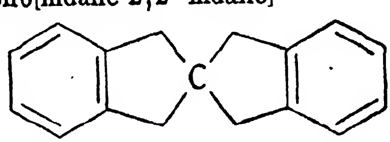
**1-(Propen-2′-yl)-3, 4-dihydrophenanthrene**



M. P., °C
129–130.5[56]

---

**Spiro[indane-2,2′-indane]**



M. P., °C
66–67[37]

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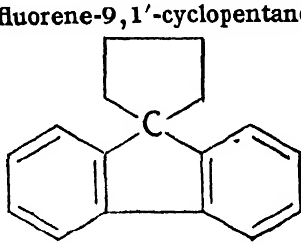
**Spiro[fluorene-9,1′-cyclopentane]**



M. P., °C
91[2]

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**$x_4$-Tetrahydro-x,x-benzofluorene** (a)

M. P., °C
129[34]

(a) The structure of this compound was not clearly defined in the literature.

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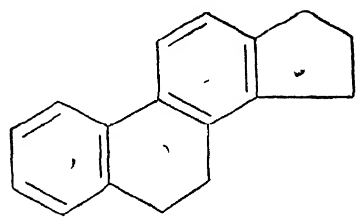
**1,2-Cyclopentano-9,10-dihydrophenanthrene**



M. P., °C
65–69[11]

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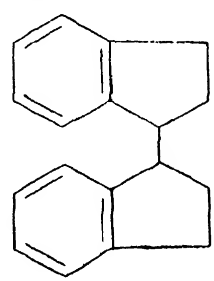
## $C_{18}H_{18}$

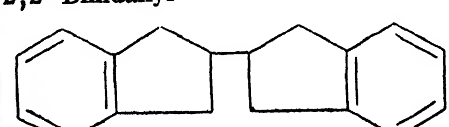
**1,1′-Biindanyl**



B. P., °C @ 760mm
194–195 14[62]
$D_4^{20}$
1.0669 24° [62]

---

**2,2′-Biindanyl**



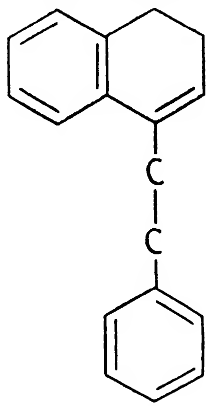
M. P., °C

165–166[24,25]

B. P., °C @ 760mm

| | |
|---|---|
| 239–241 | 50[61] |
| 225–226 | 20[61] |

**4-Phenethyl-1,2-dihydronaphthalene**



M. P., °C

| | |
|---|---|
| 209–212 | 16[15] |
| 165–168 | 12[54] |

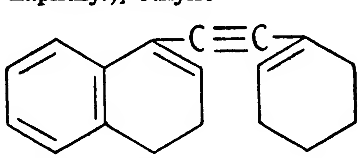
**x-Phenethenyl-1,2,3,4-tetrahydronaphthalene (a)**

B. P., °C @ 760mm

| | |
|---|---|
| 216–218 | 18[60] |

(a) The structure of this compound was not clearly defined in the literature.

**Cyclohexen-1-yl-[4′-(1′,2′-dihydronaphthyl)]-ethyne**



B. P., °C @ 760mm

| | |
|---|---|
| 170–172 | 2[46] |

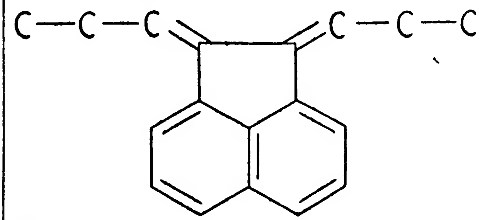
$D_4^{20}$

1.0443[46]

$n_D^{20}$

1.6186[46]

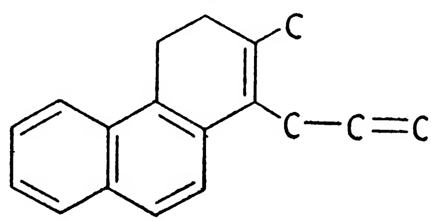
**1,2-Dipropylideneacenaphthene**



M. P., °C

101[41]

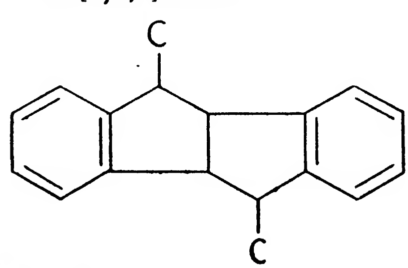
**1-(Propen-2′-yl)-2-methyl-3,4-dihydrophenanthrene**



B. P., °C @ 760mm

| | |
|---|---|
| 177–179 | 0.6[12] |

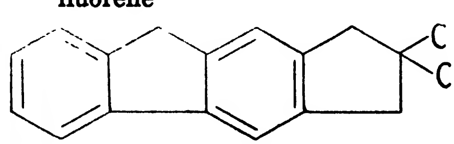
**2,3,6,7-Dibenzo-4,8-dimethylbicyclo-[3,3,0]-octane**



M. P., °C

94[7]

**2,3-(4′,4′-Dimethylcyclopentano)-fluorene**



M. P., °C
135–137 (a)[32]
128–129 (a)[32]

(a) These constants were determined on different forms.

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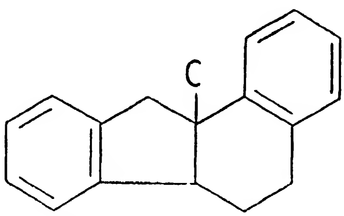
**1,2-Benzo-9a-methyl-3,4,4a,9a-tetrahydrofluorene**



B.P., °C @ 760mm
159 0.8[16]

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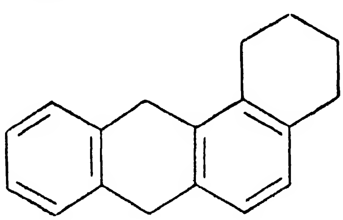
**1,2-Cyclohexano-9,10-dihydroanthracene**



M. P., °C
69.3–69.9[29]

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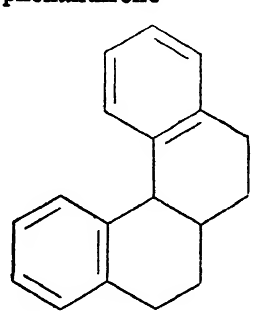
**3,4-Benzo-1,2,4a,9,10,10a-hexahydrophenanthrene**

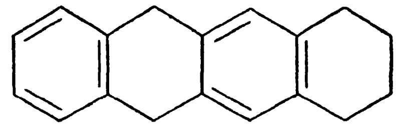


M. P., °C
47.5–48[33]

B. P., °C @ 760mm
148–153 0.2[33]

---

**1,2,3,4,6,11-Hexahydronaphthacene**



M. P., °C
128[71]

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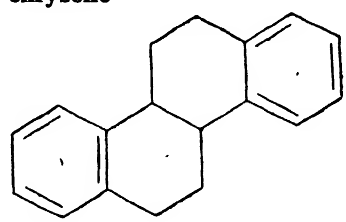
**4b,5,6,10b,11,12-Hexahydrochrysene**



M. P., °C
140 (a)[4]
115 (a)[50]
112 (a)[49]
79 (a)[49]
76.8–77.8 (b)[44]
75 (b)[4, 50]

B. P., °C @ 760mm
223 (a) 12[50]
208 (b) 12[50]

(a) These constants were determined on the *trans* isomer of the compound.
(b) These constants were determined on the *cis* isomer of the compound.

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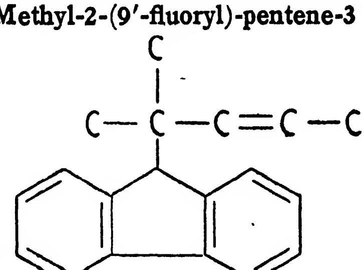
## $C_{19}H_{20}$

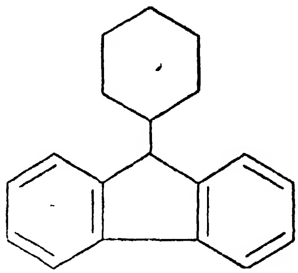
**2-Methyl-2-(9′-fluoryl)-pentene-3**



M. P., °C
92[31]

---

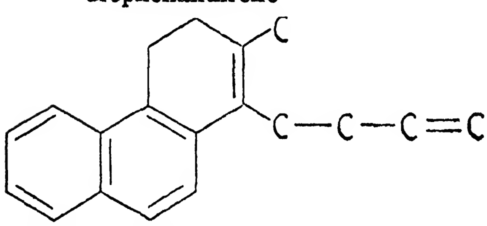
**9-Cyclohexylfluorene**



M. P., °C
115-116[9]
102-103[13]

---

**1-(Buten-3′-yl)-2-methyl-3,4-dihydrophenanthrene**



B. P., °C @ 760mm
155-160 0.3[12]

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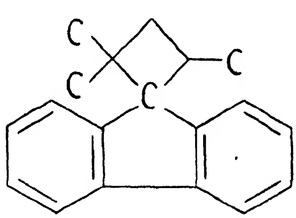
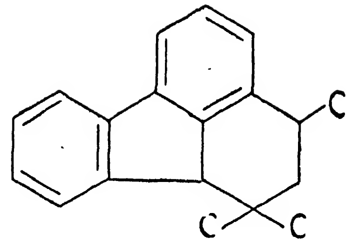
**Spiro[2,2,4-trimethylcyclobutane-1,9′-fluorene]**



M. P., °C
92-94[31]

---

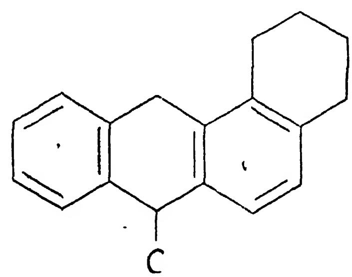
**Benzo-[lm]-2,4,4-trimethyl-2,3,4,4a-tetrahydrofluorene**



M. P., °C
103-104[31]

---

**1,2-Cyclohexano-10-methyl-9,10-dihydroanthracene**



M. P., °C
155.5-156[29]

---

## $C_{20}H_{22}$

**x-Naphthyl-2,2-dimethyl-3-methylenebicyclo-[2,2,1]-heptane (a)**

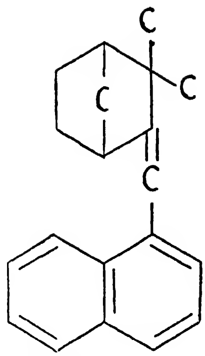
M. P., °C
92-93[8]

B. P., °C @ 760mm
210 16[8]

(a) The structure of this compound was not clearly defined in the literature.

---

**2,2-Dimethylbicyclo-[2,2,1]-heptyliden-3-yl-(1′-naphthyl)-methane**



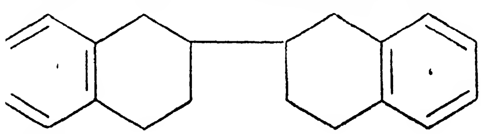
B. P., °C @ 760mm

186.5–188 1[1]

$D_4^{20}$

1.0525 $D_0^{20}$

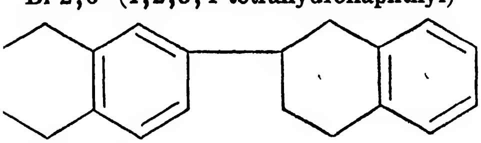
### Bi-2,2′-(1,2,3,4-tetrahydronaphthyl)



M. P., °C

113[72]

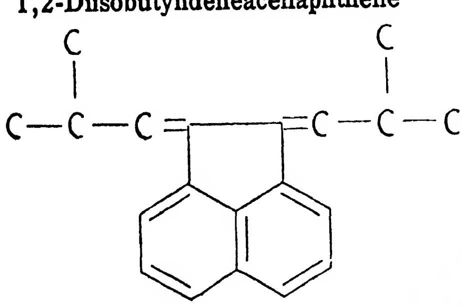
### Bi-2,6′-(1,2,3,4-tetrahydronaphthyl)



M. P., °C

53–54[57]

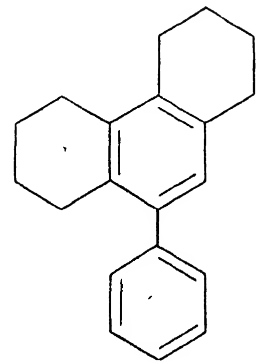
### 1,2-Diisobutylideneacenaphthene




B. P., °C @ 760mm

215 15[41]

### 9-Phenyl-1,2,3,4,5,6,7,8-octahydrophenanthrene



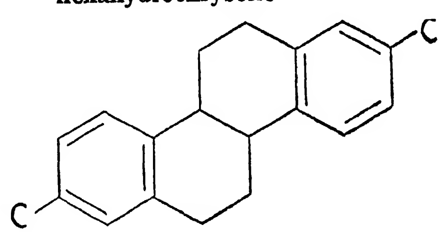
M. P., °C

94[22]

B. P., °C @ 760mm

186 0.2[22]

### 2,8-Dimethyl-4b,5,6,10b,11,12-hexahydrochrysene



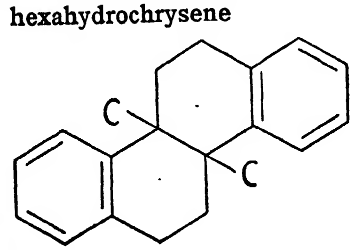
M. P., °C

140 (a)[49]

108 (a)[49]

(a) These constants were determined on different forms.

### 4b,10b-Dimethyl-4b,5,6,10b,11,12-hexahydrochrysene

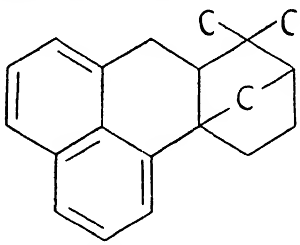


M. P., °C
144 (a)[49]
105 (a)[49]

(a) These constants were determined on different forms.

---

**Benzo-[fg]-1,1-dimethyl-2,4a-methylene-1,2,3,4,4a,9,9a-heptahydroanthracene** (a)



B. P., °C @ 760mm
185–186 1[1]

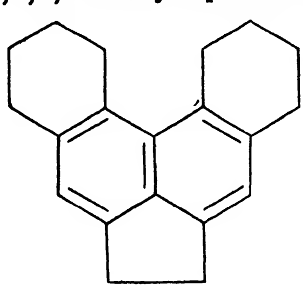
$D_4^{20}$
1.0991 $D_0^{20}$ [1]

$n_D^{20}$
1.6205[1]

(a) The structure of this compound was not clearly defined in the literature.

---

**Cyclohexano-[g]-cyclopentano-[jk]-1,2,3,4-tetrahydrophenanthrene**

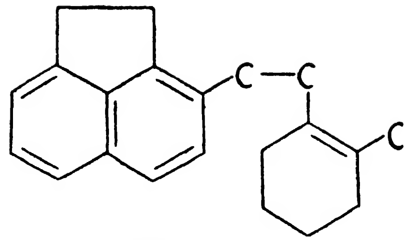


M. P., °C
148.6–149.0[28]

---

## $C_{21}H_{24}$

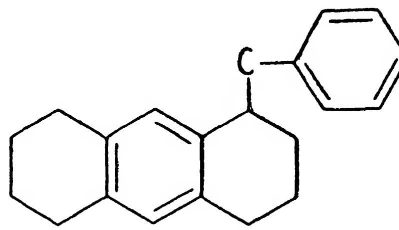
**1-(3′-Acenaphthyl)-2-(2″-methylcyclohexen-1″-yl)-ethane**



B. P., °C @ 760mm
182–185 0.2–0.3[14]

---

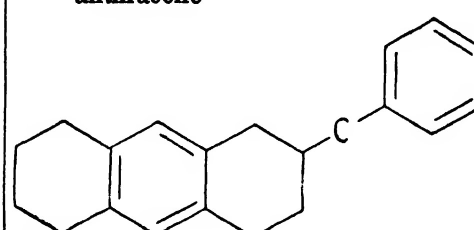
**1-Benzyl-1,2,3,4,5,6,7,8-octahydroanthracene**



B. P., °C @ 760mm
244–246 14[58]

---

**2-Benzyl-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C
65–66[58]

B. P., °C @ 760mm
248–251 12[58]

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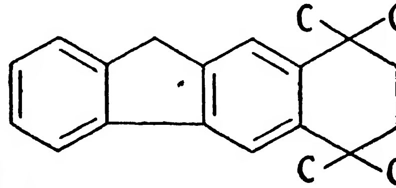
**2,3-(3′,3′,6′,6′-Tetramethylcyclohexano)-fluorene**



M. P., °C
93–94[10]

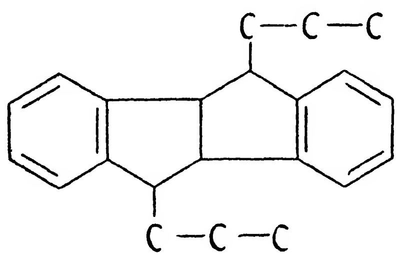
### $C_{22}H_{26}$

**1,1-Di-[x'-(x'$_4$-tetrahydronaphthyl)]-ethane** (a)

B. P., °C @ 760mm
384[52]
261–263 16[52]

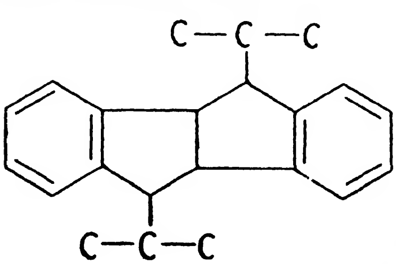
(a) The structure of this compound was not clearly defined in the literature.

**3,4,7,8-Dibenzo-2,6-di-*n*-propylbicyclo-[3,3,0]-octane**
(9,12-Di-*n*-propyldiphensuccindane)



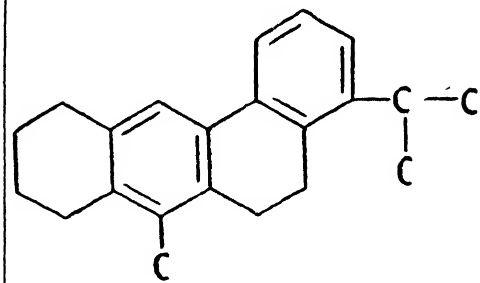
M. P., °C
98–99[6]

**3,4,7,8-Dibenzo-2,6-diisopropylbicyclo-[3,3,0]-octane**
(9,12-Diisopropyldiphensuccindane)



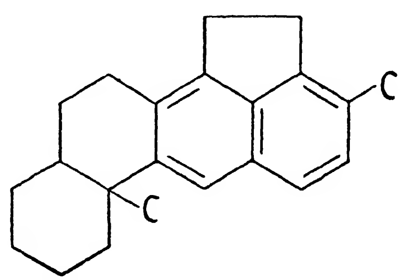
M. P., °C
80–81[6]

**1-Isopropyl-6,7-cyclohexano-8-methyl-9,10-dihydrophenanthrene**



M. P., °C
44.8–46[27]

**3,6b-Dimethyl-6b,7,8,9,10,10a,11,12-octahydrocholanthrene**



M. P., °C
132–134[13]

### $C_{28}H_{38}$

**x,x,x-Tricyclohexylnaphthalene** (a)

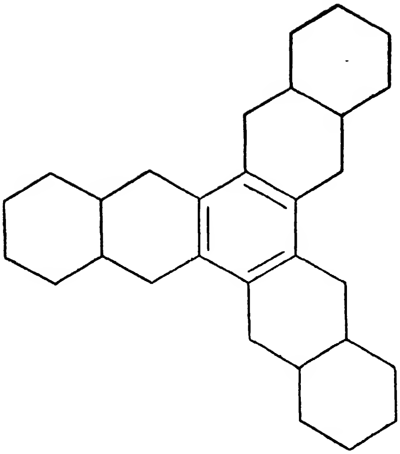
M. P., °C
121–122[47]

(a) The structure of this compound was not clearly defined in the literature.

### $C_{30}H_{42}$

**1,2,3,4,5,6-Tri-(3',2'-octahydronaphtho)-benzene**

**$C_{30}H_{42}$**



M. P., °C
360–362[48]

---

**$C_{33}H_{48}$**

**3-Phenylcholestadiene-2,4** (a)

M. P., °C
174–175[65]

Additional Data
$[\alpha]^{29}_{D} = -133°$ [65]

(a) The structure of this compound was not clearly defined in the literature.

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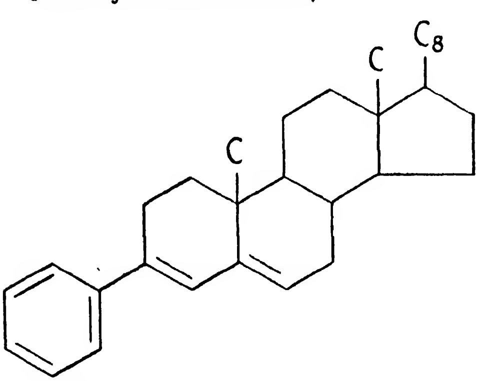
**3-Phenylcholestadiene-3,5**

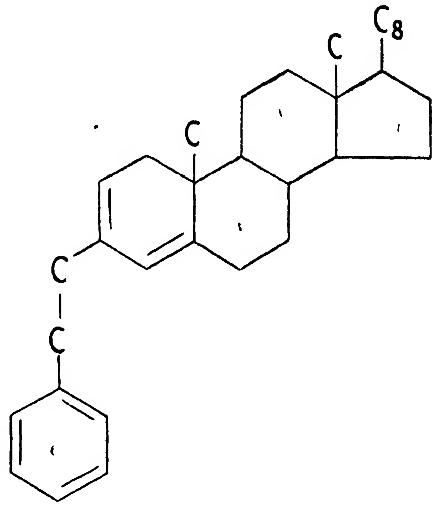



M. P., °C
158–159[3]

Additional Data
$[\alpha]^{25}_{D} = -132°$ [3]

**$C_{35}H_{52}$**

**3-Phenethylcholestadiene-2,4**




M. P., °C
94–95[19]

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**$C_{36}H_{54}$**

**Phenylfriedelene** (a)

M. P., °C
269–271[21]

(a) The structure of this compound was not clearly defined in the literature.

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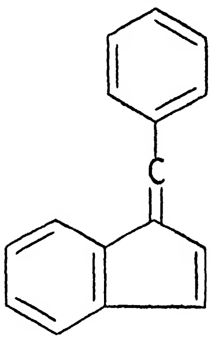
# VII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-20}$

## 1. INDENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-20}$

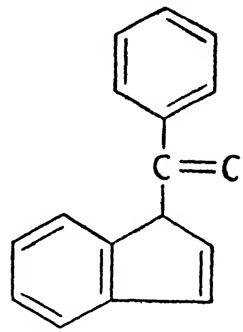
### $C_{16}H_{12}$

**1-Benzylideneindene**
(Phenylbenzofulvene)



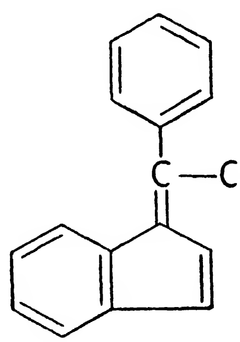
M. P., °C
88-89[7]
88[2, 4]
87[3]

**1-Phenyl-1-indenylethene**



M. P., °C
80[2]

**1-Phenyl-1-indenylidene-ethane**



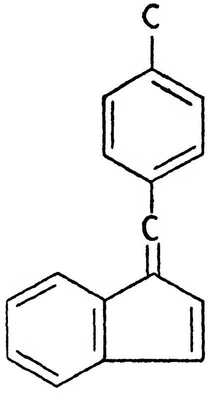
M. P., °C
70[2]
68–69[6]

B. P., °C @ 760mm

| | |
|---|---|
| 204–205 | 16[6] |
| 178–179 | 5[6] |

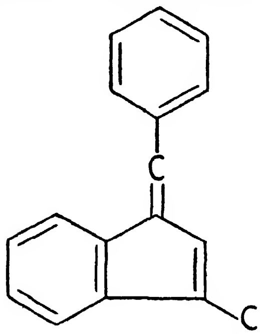
### $C_{17}H_{14}$

**1-(4′-Methylbenzylidene)-indene**



M. P., °C
91–92[1]

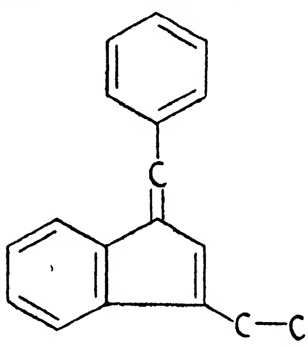
**1-Benzylidene-3-methylindene**



M. P., °C
43–44[5, 9]

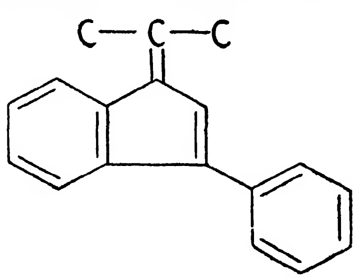
$C_{18}H_{16}$

**1-Benzylidene-3-ethylindene**



M. P., °C
58[8]

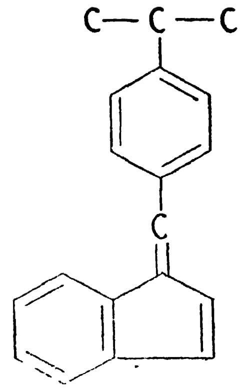
**1-Isopropylidene-3-phenylindene**



M. P., °C
99.5–100[10]

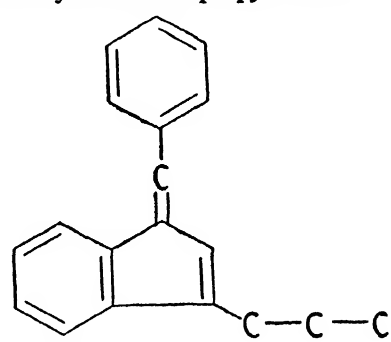
$C_{19}H_{18}$

**1-(4′-Isopropylbenzylidene)-indene**



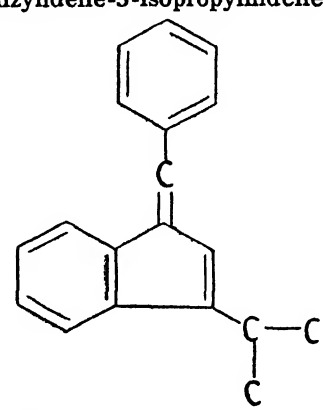
M. P., °C
60–61[1]

**1-Benzylidene-3-*n*-propylindene**



M. P., °C
132[8]

**1-Benzylidene-3-isopropylindene**



M. P., °C
101[6]

*References on Indene Derivatives of Empirical Formula $C_nH_{2n-20}$*

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## 2. NAPHTHALENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-20}$

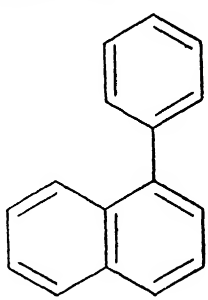
### $C_{16}H_{12}$

**Cyclopentadien-2,4-ylidene-(x′-naphthyl)-methane** (a)

M. P., °C
87–88[16]

(a) The structure of this compound was not clearly defined in the literature.

**1-Phenylnaphthalene**



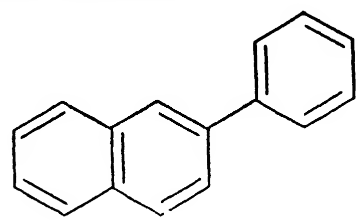
M. P., °C
84–86[6]

B. P., °C @ 750mm

| | |
|---|---|
| 336–337[29] | |
| 324–326[59] | |
| 324–325[31] | |
| 334 | 770[61] |
| 194 | 18[29] |
| 192–195 | 16–17[51] |
| 190 | 12[42] |
| 189–190 | 12[60] |
| 187–189 | 12[56] |
| 186–188 | 10[52] |
| 134–135 | 2[60] |

$D_4^{20}$
1.103[56]

**2-Phenylnaphthalene**



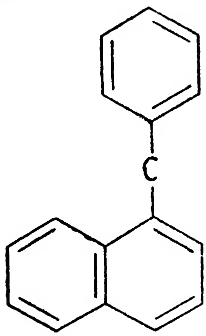
M. P., °C
102
104–105[1]
104[27]
103–104[10]
103[23]
102.2–102.7[18]
102–102.5[2]
101.5–102[4]
101–102 (a)
101.5[11, 32]
101–101.5[9]
101[49]
98.5–100[13]
98–99[19]
97–98[35]

B. P., °C @ 760mm
357–358[23]
346–347[54]
345–346[9, 11]

(a) The melting point 101–102 is found in references 7, 22, 31, 45, 46, 47, 50, 54, 55, 57.

## $C_{17}H_{14}$

**1-Benzylnaphthalene**



M. P., °C
58.6
59 (a)
59 (b)[58]
58–59[43]
58.5[17]
58[33]
57.5–58[8]
57–58[41]

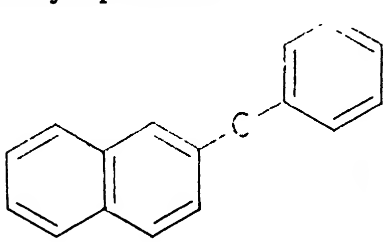
B. P., °C @ 760mm
350[58]
200–205 9[37]

$D_4^{20}$
1.165 0° [38, 53]

(a) The melting point 59 is found in references 3, 14, 21, 25, 38, 44, 53.

(b) This constant was given as a freezing point in the literature.

**2-Benzylnaphthalene**



M. P., °C
58[8]
57[3]
55.5[16]
55–55.5[53]
39–40[41]
35.5[38]

$D_4^{20}$
1.176 0° [38, 53]

**x-Benzylnaphthalene** (a)

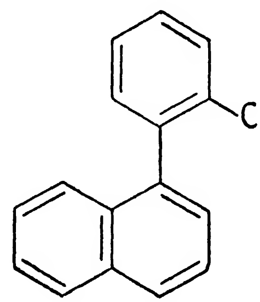
M. P., °C
64[20]
58.6[30]
58[28]

B. P., °C @ 760mm
168.5–169 1.5[24]

$D_4^{20}$
1.0777[24]
1.166 17° [30]

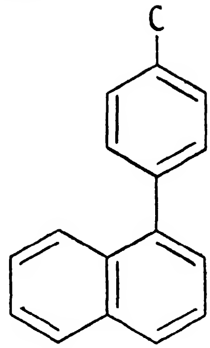
(a) The structure of this compound was not clearly defined in the literature.

**1-*o*-Tolylnaphthalene**



M. P., °C
67.5–68.5[13]
63[26]

**1-*p*-Tolylnaphthalene**



B. P., °C @ 760mm

148–150 0.15[5]

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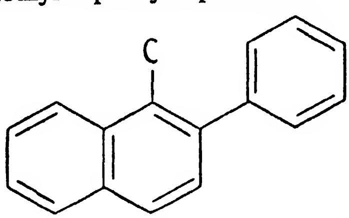
**1-Methyl-2-phenylnaphthalene**



M. P., °C

84[49]

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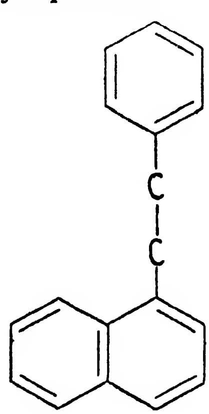
$C_{18}H_{16}$

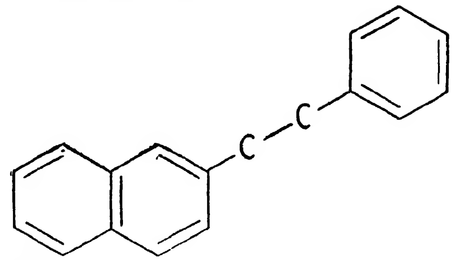
**1-Phenethylnaphthalene**



B. P., °C @ 760mm

175 5[12]

**2-Phenethylnaphthalene**



M. P., °C

99–100[12]

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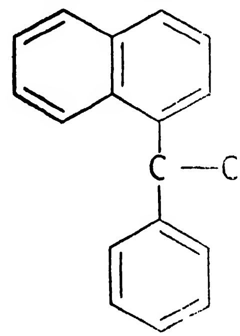
**1-Phenyl-1-(1′-naphthyl)-ethane**



M. P., °C

69[48]

B. P., °C @ 760mm

220–222 15[48]

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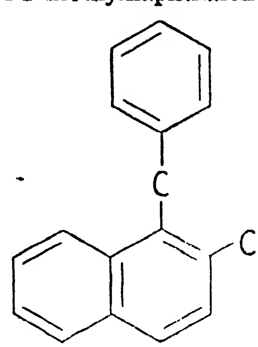
**1-Benzyl-2-methylnaphthalene**



B. P., °C @ 760mm

221–222 17[15]

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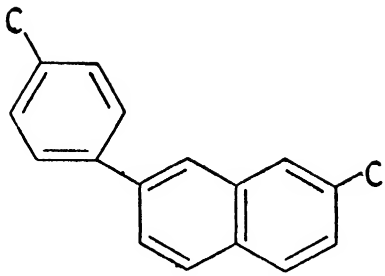
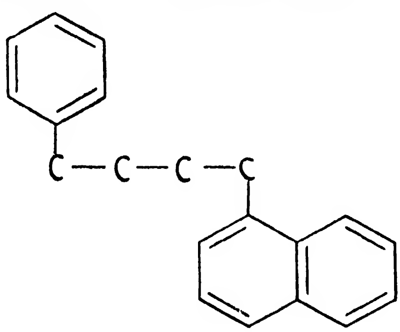
**2-Methyl-7-*p*-tolylnaphthalene**



M. P., °C
140–141[55]

## $C_{20}H_{20}$

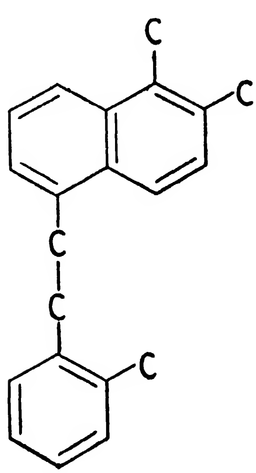
**1-Phenyl-4-(1′-naphthyl)-butane**



M. P., °C
80.5–82[40]

## $C_{21}H_{22}$

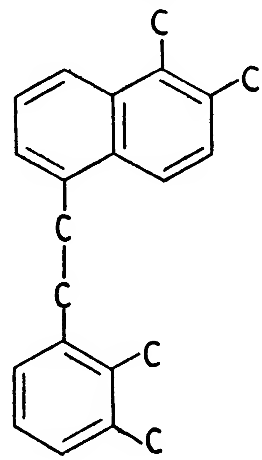
**1,2-Dimethyl-5-(2′-methylphenethyl)-naphthalene**



M. P., °C
60[39]

## $C_{22}H_{24}$

**1,2-Dimethyl-5-(2′,3′-dimethylphenethyl)-naphthalene**



M. P., °C
90.5–91.5[39]

## $C_{31}H_{42}$

**1-Methyl-$x_4$-tetracyclopentylnaphthalene** (a)

M. P., °C
97[34]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{34}H_{48}$

**$x_4$-Tetracyclohexylnaphthalene** (a)

M. P., °C
269[35]

(a) The structure of this compound was not clearly defined in the literature.

*References on Naphthalene Derivatives of Empirical Formula $C_nH_{2n-20}$*

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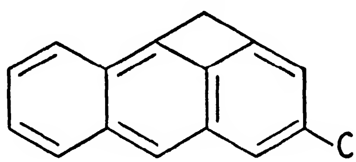
## 3. CYCLANOANTHRACENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-20}$

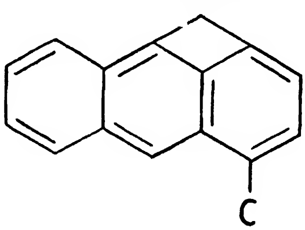
### $C_{16}H_{12}$

**Cyclobutano-[mn]-3-methylanthracene**



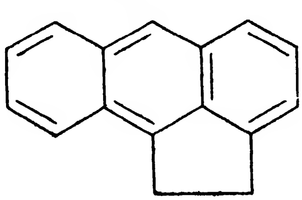
M. P., °C
85[2, 4]

**Cyclobutano-[mn]-4-methylanthracene**



M. P., °C
63[2]

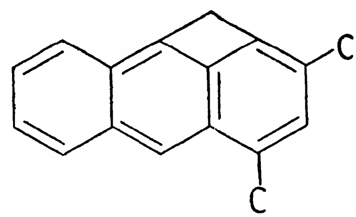
**Cyclopentano-[de]-anthracene**
(Aceanthrene)



M. P., °C
113[9]

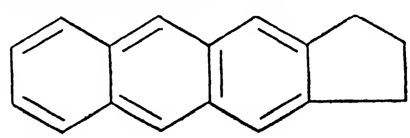
### $C_{17}H_{14}$

**Cyclobutano-[mn]-2,4-dimethylanthracene**



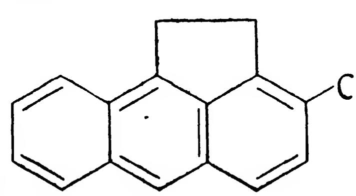
M. P., °C
64[3]

**2,3-Cyclopentanoanthracene**



M. P., °C
242–243[10]

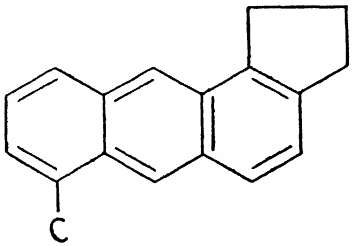
**Cyclopentano-[mn]-2-methylanthracene**



M. P., °C
122[1]

## $C_{18}H_{16}$

**1,2-Cyclopentano-5-methylanthracene**



M. P., °C
131–132[5]

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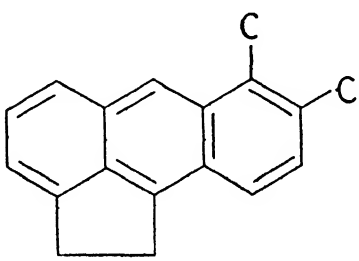
**Cyclopentano-[fg]-1,2-dimethylanthracene**



M. P., °C
206–207[5]

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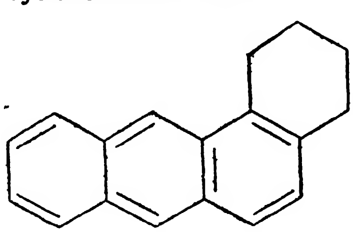
**1,2-Cyclohexanoanthracene**



M. P., °C
104.5–105[7]

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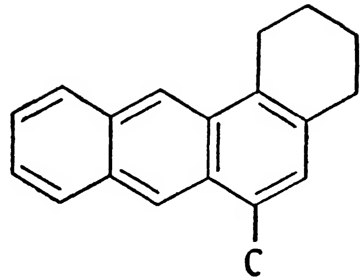
## $C_{19}H_{18}$

**1,2-Cyclohexano-4-methylanthracene**



M. P., °C
82.3–82.9[8]

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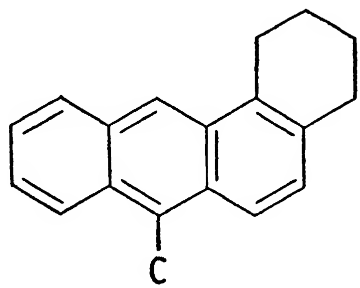
**1,2-Cyclohexano-10-methylanthracene**



M. P., °C
117.3–117.8[7]

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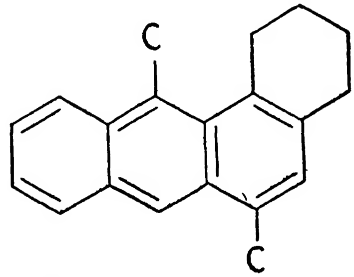
## $C_{20}H_{20}$

**1,2-Cyclohexano-4,9-dimethylanthracene**



M. P., °C
62.4–62.8[8]

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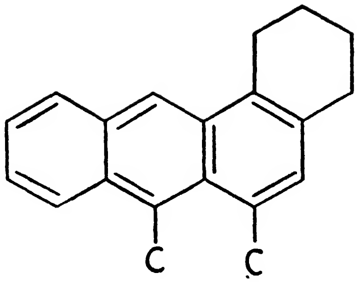
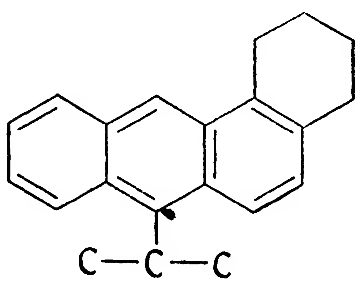
**1,2-Cyclohexano-4,10-dimethylanthracene**



M. P., °C
105–105.5[8]

$C_{21}H_{22}$

**1,2-Cyclohexano-10-isopropylanthracene**



M. P., °C
81.9–82.5[6]

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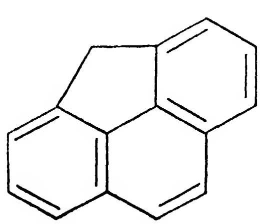
## 4. CYCLANOPHENANTHRENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-20}$

$C_{15}H_{10}$

**Cyclopentano-[def]-phenanthrene**

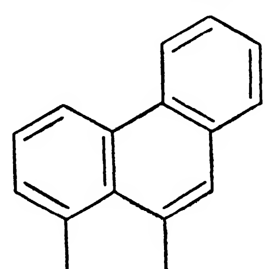


M. P., °C
116[35]
114.6–115.3[18]
114.0–115.0[7]

B. P., °C @ 760mm
353[35]

$C_{16}H_{12}$

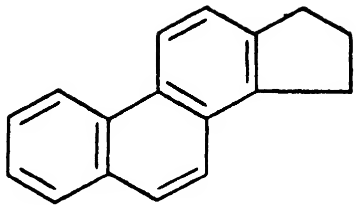
**Cyclopentano-[jk]-phenanthrene**



M. P., °C
106[25]

$C_{17}H_{14}$

**1,2-Cyclopentanophenanthrene**



M. P., °C

**135**
137–138[21]
135–136[6, 33]
134.4–135.8[38]
135[8, 28, 32]
134.5–135[17]
134–135[40]
133–134[15, 40]
132–133[5]
130–131[5]

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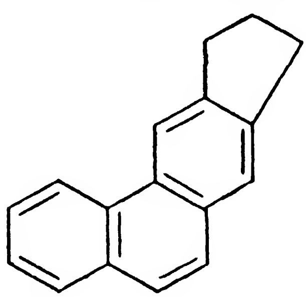
**2,3-Cyclopentanophenanthrene**



M. P., °C

**85**
85–85.5[11, 36]
84–84.5[15]
83.5–84.5[5]
84[41]

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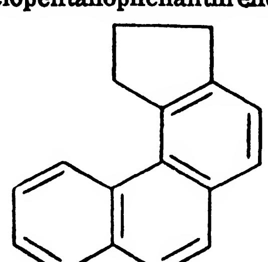
**3,4-Cyclopentanophenanthrene**



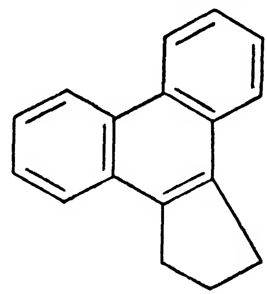
M. P., °C

73.5–75 (a)[5]
71.5–72[6]

(a) This compound remelts at 60.

---

**9,10-Cyclopentanophenanthrene**



M. P. °C

154[44, 45]
150–151[14]
149–150[5]

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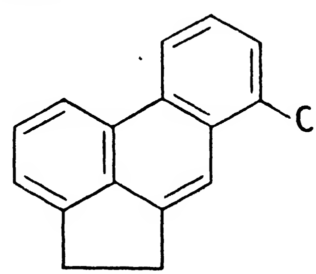
**Cyclopentano-[jk]-1-methylphenanthrene**



M. P., °C

159[25]

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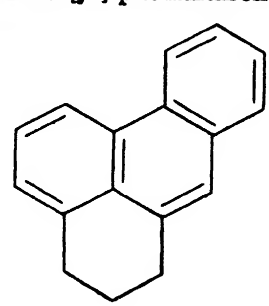
**Cyclohexano-[jk]-phenanthrene**

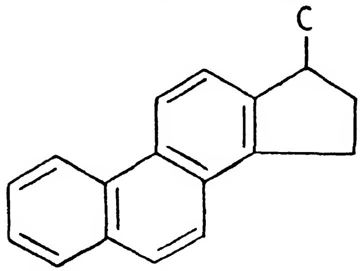


M. P., °C
81–82[16]
76–77[5]

---

$C_{18}H_{16}$

**1,2-(3′-Methylcyclopentano)-phenanthrene**
(Diels' Hydrocarbon)



M. P., °C
126
128–129 (a)[19]
126.5–127[31]
126–127[12, 30, 38]
126[37]
125–126[22, 27, 29, 43]
125 (a)[20]
124–125[10, 42]
123–124[39]

B. P., °C @ 760mm
162–165 0.1[29]

(a) Diels assigned the structure of 1,2- (cyclopenten-3′-o) -7,8- (3″-ethylcyclopenten-3″-o) - naphthalene to this compound, but it was later proved to be the above compound.

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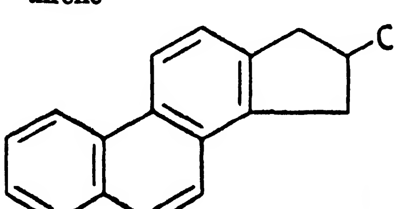
**1,2-(4′-Methylcyclopentano)-phenanthrene**



M. P., °C
106.5–107[40]

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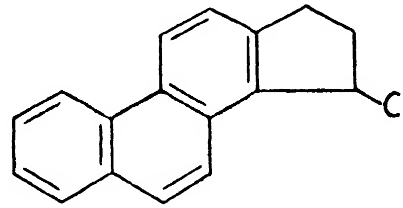
**1,2-(5′-Methylcyclopentano)-phenanthrene**



M. P., °C
76–77[40]

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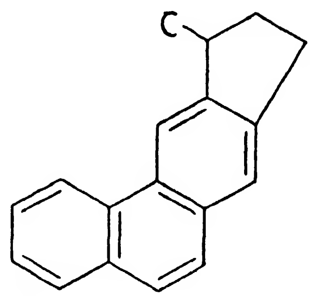
**2,3-(3′-Methylcyclopentano)-phenanthrene**



M. P., °C
75–76[30]

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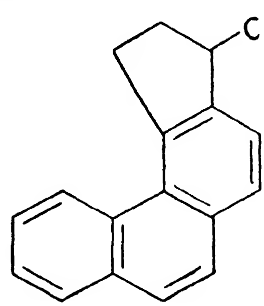
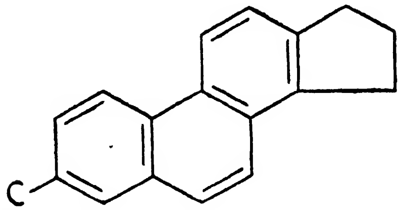
**3,4-(5′-Methylcyclopentano)-phenanthrene**



M. P., °C
28–29[30]

B. P., °C @ 760mm
172–173 0.05[30]

**1,2-Cyclopentano-7-methylphenanthrene**




M. P., °C
132[34]

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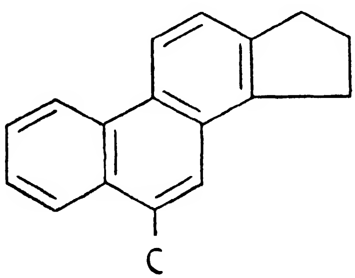
**1,2-Cyclopentano-9-methylphenanthrene**




M. P., °C
109–110[26]

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**x,x-Cyclopentano-x-methylphenanthrene** (a)

M. P., °C
147[9]

(a) The structure of this compound was not clearly defined in the literature.

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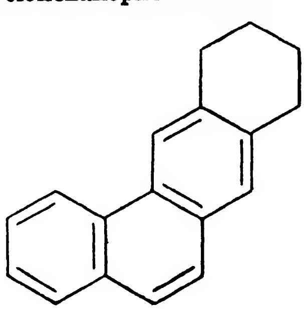
**2,3-Cyclohexanophenanthrene**



M. P., °C
88.5–89.5[24]

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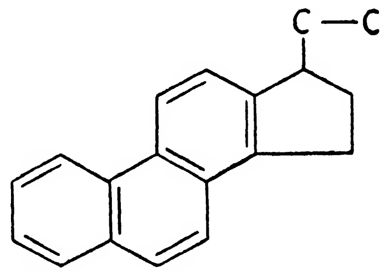
## $C_{19}H_{18}$

**1,2-(3′-Ethylcyclopentano)-phenanthrene**




M. P., °C
85–86[38]

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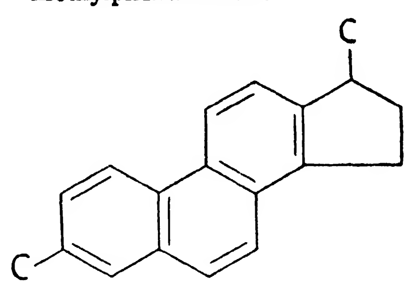
**1,2-(3′-Methylcyclopentano)-7-methylphenanthrene**




M. P., °C
139–140[34]

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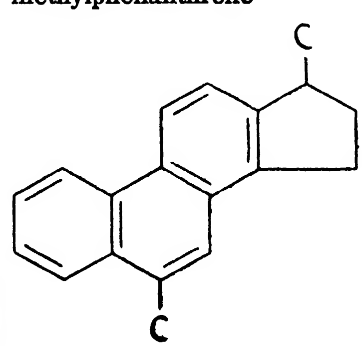
**1,2-(3′-Methylcyclopentano)-9-methylphenanthrene**



M. P., °C
80[26]

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**x,x-Dimethyl-x,x-cyclopentanophenanthrene** (a)

M. P., °C
165[23]

(a) The structure of this compound was not clearly defined in the literature.

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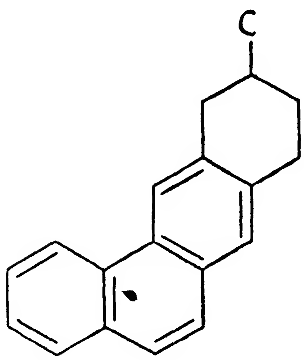
**2,3-(4'-Methylcyclohexano)-phenanthrene**



M. P., °C
114–115.5[4]

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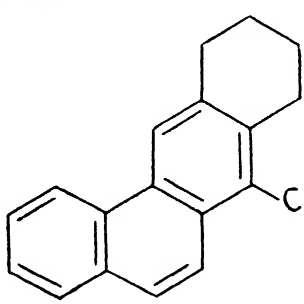
**2,3-Cyclohexano-1-methylphenanthrene**



M. P., °C
73.7–74.5[18]
73.9–74.4[24]

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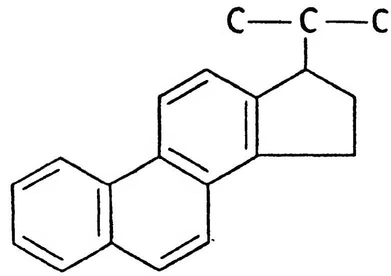
## $C_{20}H_{20}$

**1,2-(3'-Isopropylcyclopentano)-phenanthrene**



M. P., °C
97.6–98.4[38]
96[13]

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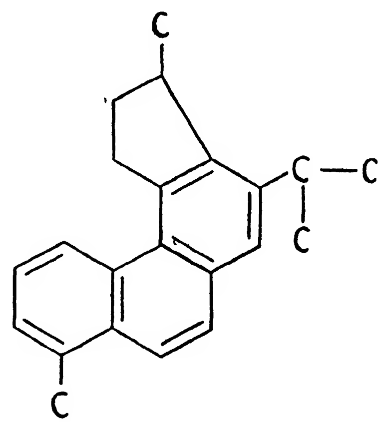
## $C_{22}H_{24}$

**3,4-(5'-Methylcyclopentano)-2-isopropyl-8-methylphenanthrene**



M. P., °C
74.5–75.5[3]

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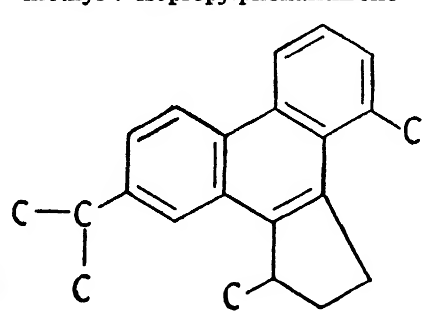
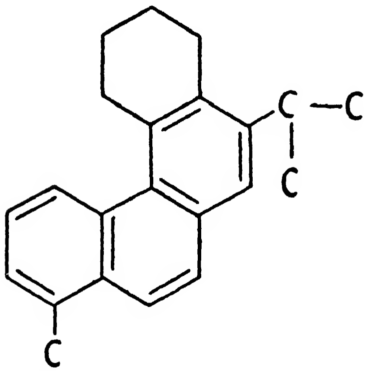
**9,10-(5'-Methylcyclopentano)-1-methyl-7-isopropylphenanthrene**



M. P., °C
74.5–75.5[1]

### 3,4-Cyclohexano-2-isopropyl-8-methylphenanthrene



M. P., °C
88–89[2]

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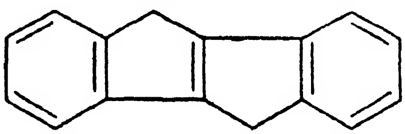
## 5. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-20}$

### $C_{16}H_{12}$

**2,3,6,7-Dibenzobicyclo-[3,3,0]-octene-1,5**
(Diphensuccindene-10)



M. P., °C
210[10, 11]

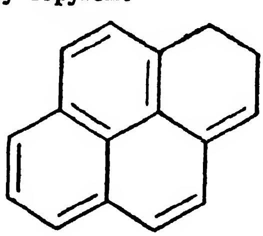
---

**x,x-Dihydrobenzo-[jk]-fluorene (a)**
M. P., °C
76[25]

(a) The structure of this compound was not clearly defined in the literature.

---

**1,2-Dihydropyrene**



M. P., °C
132[14]

---

**x,x-Dihydropyrene (a)**
M. P., °C
106[29]

(a) The structure of this compound was not clearly defined in the literature.

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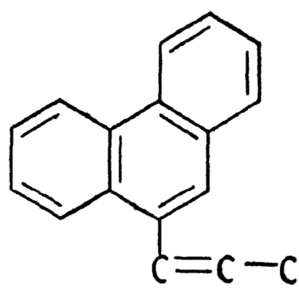
### $C_{17}H_{14}$

**9-(Propen-1′-yl)-phenanthrene**

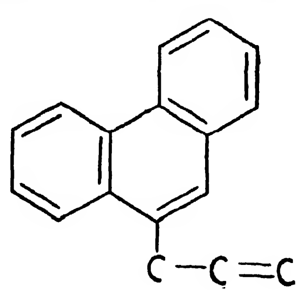


B. P., °C @ 760mm
179 2.5[6]

$n_D^{20}$
1.6928 27.5° [6]

---

**9-(Propen-2′-yl)-phenanthrene**



M. P., °C
51[6]

B. P., °C @ 760mm

161–163 1.25[6]

$n_D^{20}$

1.6280[6]

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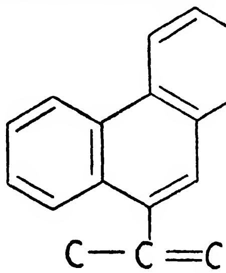
**9-Isopropenylphenanthrene**



M. P., °C

38[6]

B. P., °C @ 760mm

163 20[6]

$n_D^{20}$

1.6765[6]

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**x,x-Dihydrobenzo-[lm]-2-methyl-fluorene (a)**

M. P., °C

127–128[39]

(a) The structure of this compound was not clearly defined in the literature.

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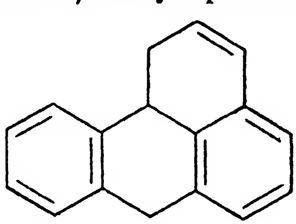
**8,9-Benzo-7,9a-dihydrophenalene**



M. P., °C

81[5]

79–80[34]

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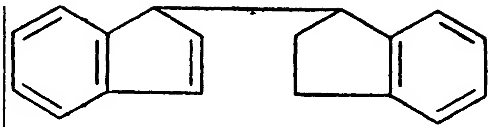
## $C_{18}H_{16}$

**1-(1′-Indanyl)-indene**



B. P., °C @ 760mm

190–192 12[8]

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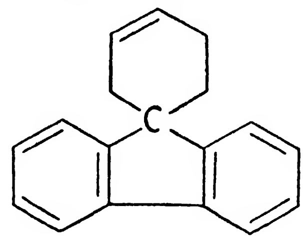
**Spiro[fluorene-9,1′-cyclohexene-3′]**



M. P., °C

145.5[41]

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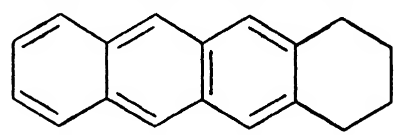
**1,2,3,4-Tetrahydronaphthacene**



M. P., °C

233[38]

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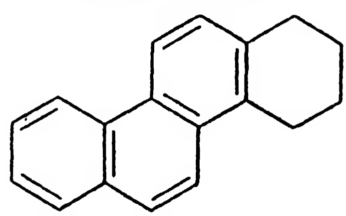
**1,2,3,4-Tetrahydrochrysene**



M. P., °C

180.5–181.5[2]

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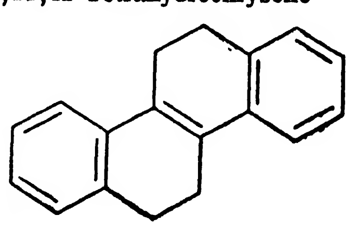
**5,6,11,12-Tetrahydrochrysene**



M. P., °C
105[33]

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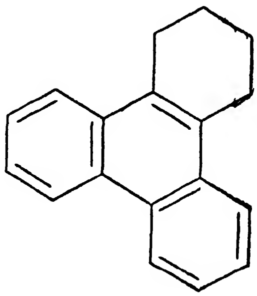
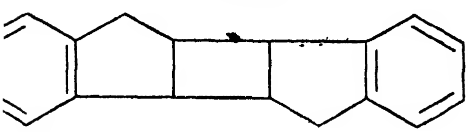
**1,2,3,4-Tetrahydrotriphenylene**



M. P., °C
122–123[9]
120–121[7]

---

**1,2,3,4-Di-(3′,2′-indano)-cyclobutane**
(Truxane)



M. P., °C
116[30, 37]

B. P., °C @ 760mm

| | |
|---|---|
| 205 | 20[37] |
| 206–207 | 13[30] |

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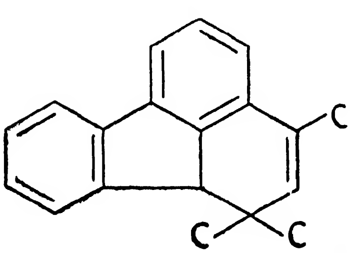
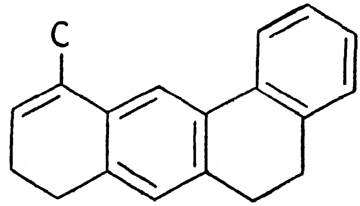
## $C_{19}H_{18}$

**Benzo-[lm]-2,4,4-trimethyl-4,4a-dihydrofluorene**



M. P., °C
77–79[22]

**1,2-Benzo-8-methyl-3,4,5,6-tetrahydroanthracene**



M. P., °C
70–70.5[19]

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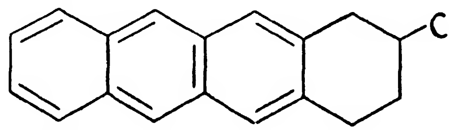
**2-Methyl-1,2,3,4-tetrahydronaphthacene**



M. P., °C
203[13]

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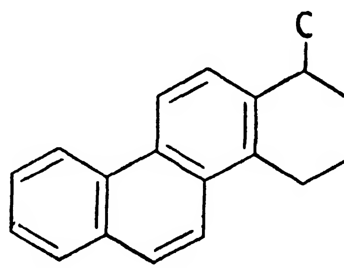
**1-Methyl-1,2,3,4-tetrahydrochrysene**



M. P., °C
120.5–121[3]

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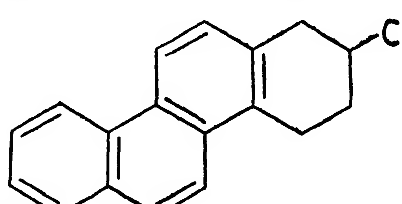
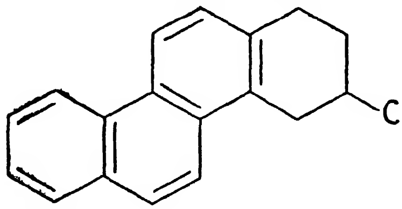
**2-Methyl-1,2,3,4-tetrahydrochrysene**



M. P., °C
141.5–142[2]

**3-Methyl-1,2,3,4-tetrahydrochrysene**



M. P., °C
130–131[3]

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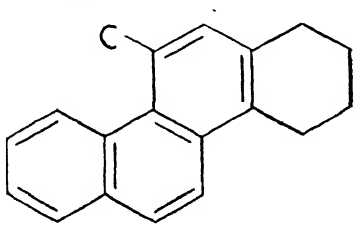
**11-Methyl-1,2,3,4-tetrahydrochrysene**



M. P., °C
71–72[1]

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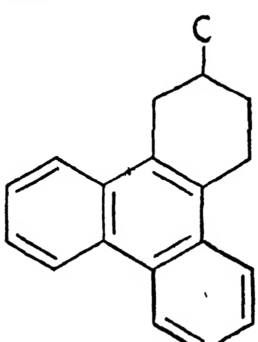
**2-Methyl-1,2,3,4-tetrahydrotriphenylene**



M. P., °C
116.2–116.8[21]

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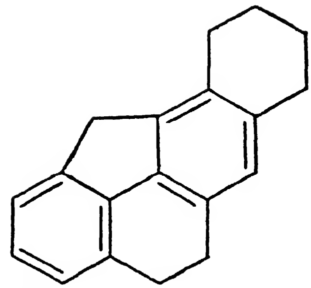
**Cyclohexano-[b]-cyclopentano-[def]-9,10-dihydrophenanthrene**



M. P., °C
83–83.5[15]

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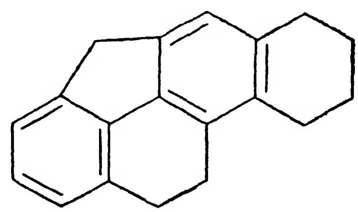
**Cyclopentano-[mno]-1,2,3,4,5,6-hexahydrochrysene**

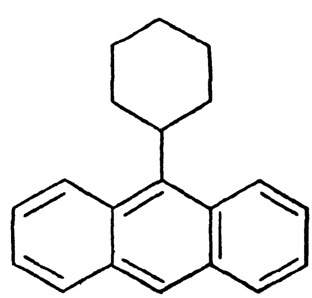


M. P., °C
116.6–117.2[15]

---

**$C_{20}H_{20}$**

**9-Cyclohexylanthracene**



M. P., °C
135–136[42, 43]

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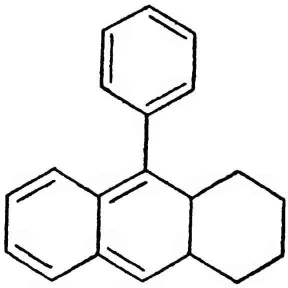
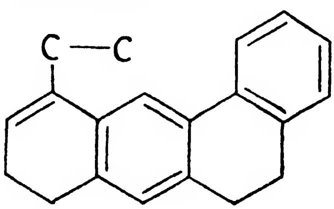
**9-Phenyl-1,2,3,4,4a,9a-hexahydroanthracene**



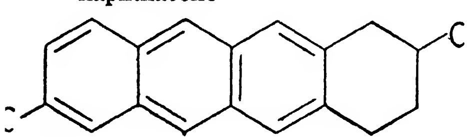
B. P., °C @ 760mm
235 1.5[23]

**1,2-Benzo-8-ethyl-3,4,5,6-tetrahydroanthracene**



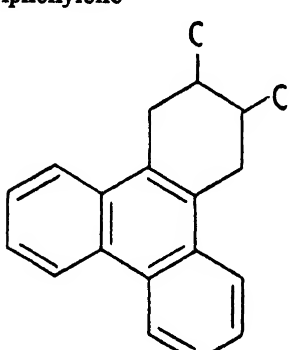
M. P., °C
65–67[20]

**2,8-Dimethyl-1,2,3,4-tetrahydronaphthacene**



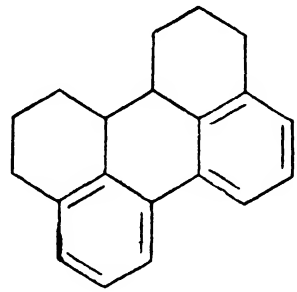
M. P., °C
214[13]

**2,3-Dimethyl-1,2,3,4-tetrahydrotriphenylene**



M. P., °C
158–160[16]

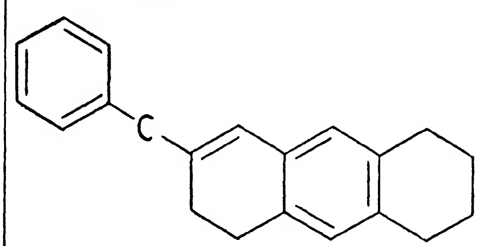
**1,2,3,10,11,12,12a,12b-Octahydroperylene**



M. P., °C
159–161[45]
119–120[44]

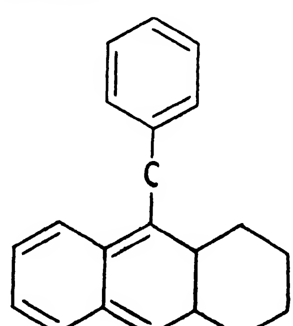
## $C_{21}H_{22}$

**7-Benzyl-1,2,3,4,5,6-hexahydroanthracene**



B. P., °C @ 760mm
255–258 13[35]

**9-Benzyl-1,2,3,4,4a,9a-hexahydroanthracene**



B. P., °C @ 760mm
255–258 20[23,24]

---

**1-Methyl-7-isopropyl-x-isopropenyl-phenanthrene (a)**

M. P., °C
64.5–65.5[28]

(a) The structure of this compound was not clearly defined in the literature.

---

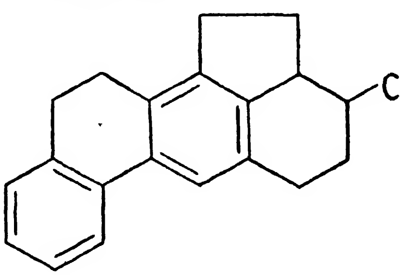
**10-Isopropyl-x₄-tetrahydro-1,2-benzo-anthracene (a)**

M. P., °C
72.5–73.5[17]

(a) The structure of this compound was not clearly defined in the literature.

---

**3-Methyl-2a,3,4,5,11,12-hexahydro-cholanthrene**



M. P., °C
157[40]
156–157[36]

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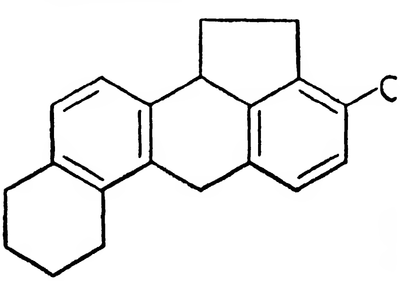
**3-Methyl-6,7,8,9,10,12b-hexahydro-cholanthrene**



M. P., °C
160–160.5[18]

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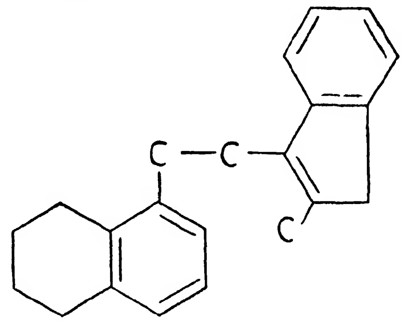
## $C_{22}H_{24}$

**1-(5′,6′,7′,8′-Tetrahydronaphthyl)-2-[3″-(2″-methylindenyl)]-ethane**

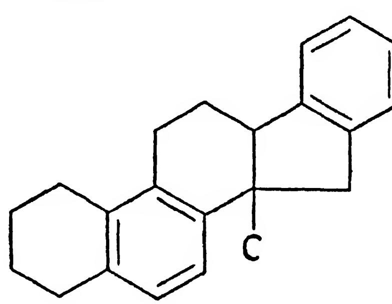


M. P., °C
73[12]

B. P., °C @ 760mm
190 0.3[12]

---

**1-Methyl-1,2-(2′,3′-indano)-1,2,3,4,5,6,7,8-octahydrophenanthrene**

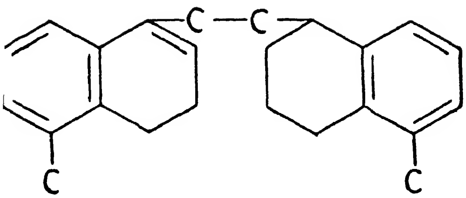


M. P., °C
123.5–124[12]

---

## $C_{24}H_{28}$

**1-[1′-(5′-Methyl-3,4-dihydronaphthyl)]-2-[1″-(5″-methyl-1″,2″,3″,4″-tetrahydronaphthyl)]-ethane**



B. P., °C @ 760mm

176–178 0.1[32]

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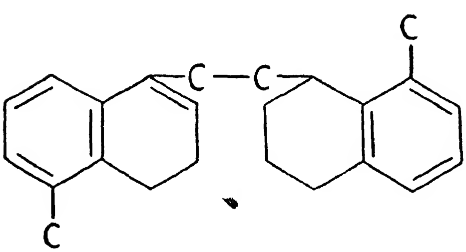
**1-[1′-(5′-Methyl-3′,4′-dihydronaphthyl)]-2-[1″-(8″-methyl-1″,2″,3″,4″-tetrahydronaphthyl)]-ethane**



B. P., °C @ 760mm

185–186 0.1[31]

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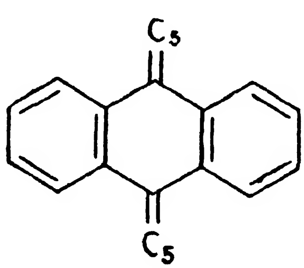
**9,10-Dipentylidene-9,10-dihydroanthracene**



M. P., °C

103–108[26]

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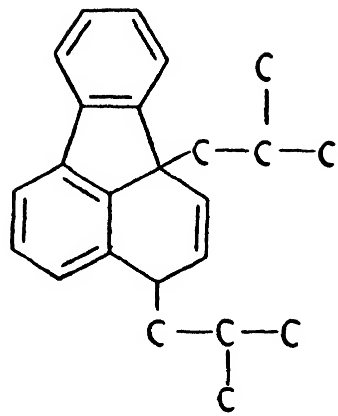
**1,2-Benzo-2a,5-diisobutyl-2a,5-dihydroacenaphthylene (a)**



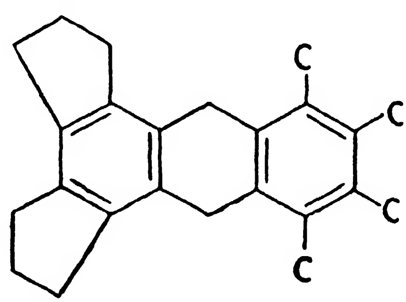
M. P., °C

160[27]

(a) The structure of this compound was not clearly defined in the literature.

---

**5,6,7,8-Dicyclopentano-1,2,3,4-tetramethyl-9,10-dihydroanthracene**



M. P., °C

255–257[4]

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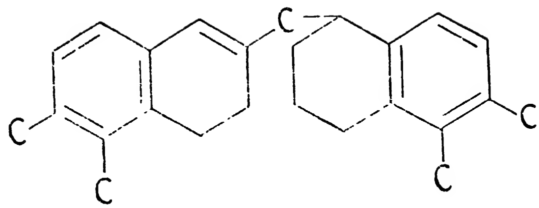
## $C_{25}H_{30}$

**2-(5,6-Dimethyl-3,4-dihydronaphthyl)-1′-(5′,6′-dimethyl-1′,2′,3′,4′-tetrahydronaphthyl)-methane**

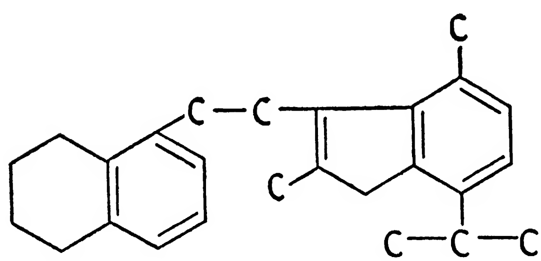


B. P., °C @ 760mm

205–210 0.05[32]

$C_{26}H_{32}$

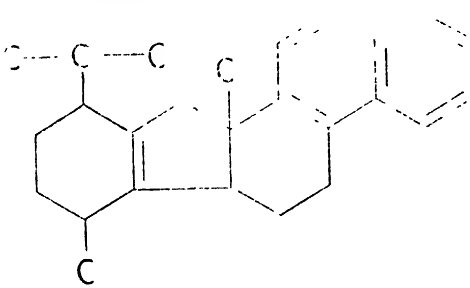
**1-[5′-(1′,2′,3′,4′-Tetrahydronaphthyl)]-2-[3″-(2″,4″-dimethyl-7″-isopropylindenyl)]-ethane**



B. P., °C @ 760mm

218 0.3[12]

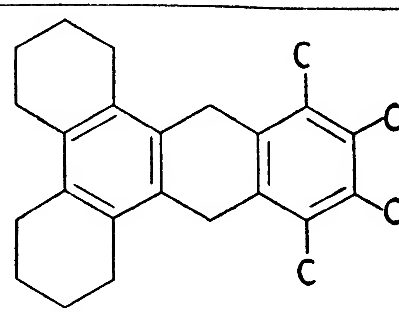
**1,2-(2′,1′-Naphtho)-5,9a-dimethyl-8-isopropyl-3,4,4a,5,6,7,8,9a-octahydrofluorene**



B. P., °C @ 760mm

215–220 0.3[12]

**1,2,3,4-Tetramethyl-5,6,7,8-dicyclohexano-9,10-dihydroanthracene**



M. P., °C

250–251[4]

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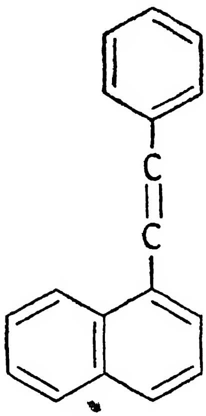
# VIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-22}$

1. Naphthalene with Phenylalkenyl Substitutions
2. Anthracene and Phenanthrene Derivatives of Empirical Formula $C_nH_{2n-22}$
3. Cyclenoanthracenes, Cyclenophenanthrenes and Their Alkyl Derivatives
4. Benzofluorenes and Their Alkyl Derivatives
5. Pyrene and Its Alkyl Derivatives
6. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-22}$

## 1. NAPHTHALENE WITH PHENYLALKENYL SUBSTITUTIONS, $C_nH_{2n-22}$

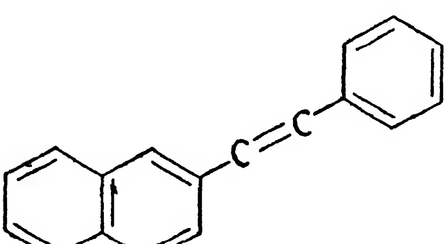
### $C_{18}H_{14}$

**1-Phenethenylnaphthalene**



M. P., °C
72.5–73.5[2]

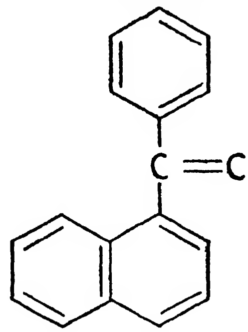
**2-Phenethenylnaphthalene** (a)



M. P., °C
205–207[12]

(a) The above formula was given for this compound, but the name given in the literature was "Phenyl-α-naphthylethylene."

**1-Phenyl-1-(1′-naphthyl)-ethene**

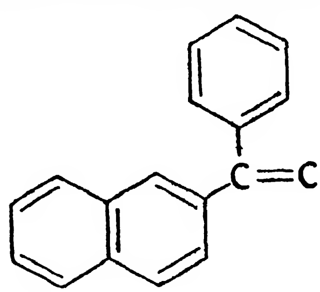


M. P., °C
60[1, 3]
59.5–60[11]

B. P., °C @ 760mm
350–355[1]

| | |
|---|---|
| 221-224 | 15[10] |
| 195–196 | 9[11] |

**1-Phenyl-1-(2′-naphthyl)-ethene**



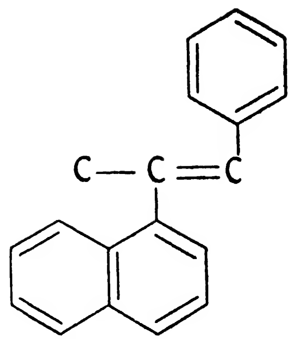
M. P., °C
52[3]

B. P., °C @ 760mm

| | |
|---|---|
| 220 | 24[3] |

### $C_{19}H_{16}$

**1-Phenyl-2-(1′-naphthyl)-propene-1**



M. P., °C
139[4]

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**x-Phenyl-x-(1′-naphthyl)-propene-x** (a)

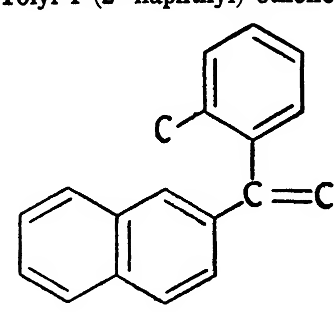
M. P., °C
55–61[6]

B. P., °C @ 760mm
232–236    22–23[6]

(a) The structure of this compound was not clearly defined in the literature.

---

**1-*o*-Tolyl-1-(2′-naphthyl)-ethene**



M. P., °C
66–66.5[5]

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**x-*p*-Tolyl-x-(1′-naphthyl)-ethene** (a)

B. P., °C @ 760mm
224–226    20[9]

$D_4^{20}$
1.0693    21.5°[9]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{21}H_{20}$

**2-Methyl-3-phenyl-3-(x′-naphthyl)-butene-1** (a)

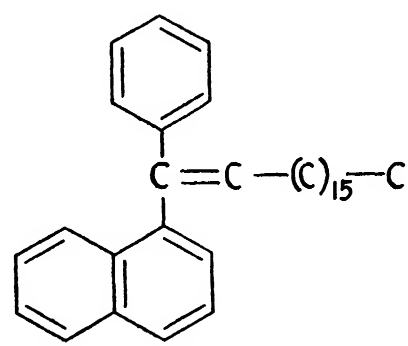
M. P., °C
85[8]

(a) The structure of this compound was not clearly defined in the literature.

---

## $C_{34}H_{46}$

**1-Phenyl-1-(1′-naphthyl)-octadecene-1**



$D_4^{20}$
0.948 (a)[7]

$n_D^{20}$
1.5558[7]

(a) This constant is an extrapolated value.

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*References on Naphthalene with Phenyl-alkenyl Substitutions*


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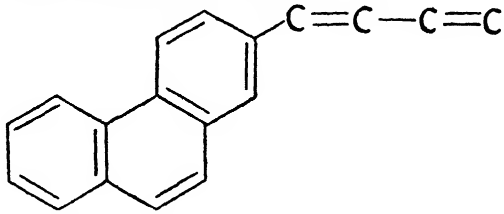
## 2. ANTHRACENE AND PHENANTHRENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-22}$

### $C_{18}H_{14}$

**1-(2′-Phenanthryl)-butadiene-1,3**



M. P., °C
125[6]

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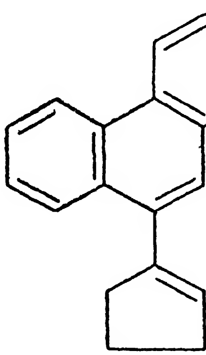
### $C_{19}H_{16}$

**9-(Cyclopenten-1′-yl)-phenanthrene**



B. P., °C @ 760mm
185 0.85[1]

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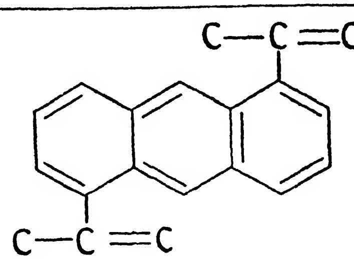
### $C_{20}H_{18}$

**1,5-Diisopropenylanthracene**



M. P., °C
121[4]

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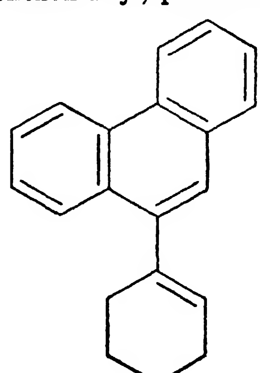
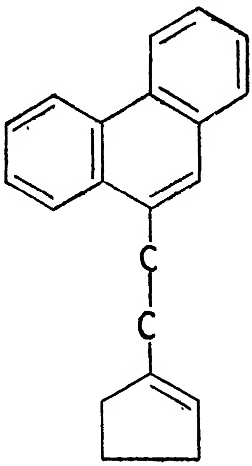
**9-(Cyclohexen-1′-yl)-phenanthrene**



M. P., °C
132[1]

## $C_{21}H_{20}$

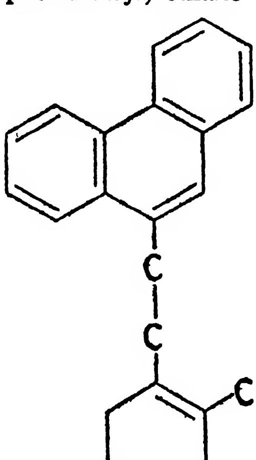
1-(Cyclopenten-1′-yl)-2-(9″-phenanthryl)-ethane



M. P., °C
105.5–107[2]

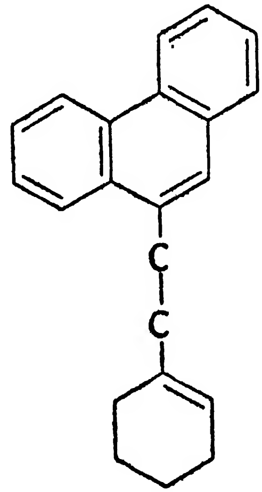
## $C_{22}H_{22}$

1-(2′-Methylcyclopenten-1′-yl)-2-(9″-phenanthryl)-ethane



M. P., °C
73–75[2]

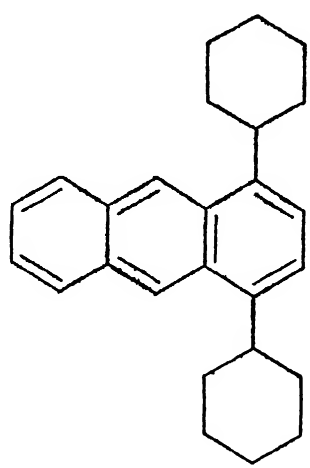
1-(Cyclohexen-1′-yl)-2-(9″-phenanthryl)-ethane



B. P., °C @ 760mm
205–206    0.4[5]

## $C_{26}H_{30}$

1,4-Dicyclohexylanthracene



M. P., °C
160–161[3]

*References on Anthracene and Phenanthrene Derivatives of Empirical Formula $C_nH_{2n-22}$*

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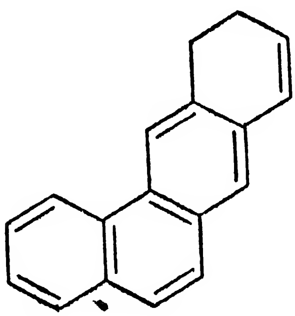
## 3. CYCLENOANTHRACENES, CYCLENOPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-22}$

### $C_{18}H_{14}$

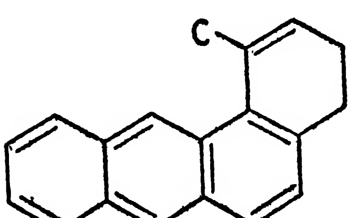
**2,3-(Cyclohexen-5′-o)-phenanthrene**



M. P., °C
112–113.5[1]

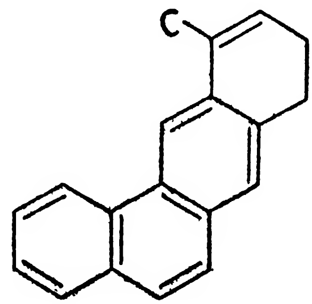
### $C_{19}H_{16}$

**1,2-(3′-Methylcyclohexen-3′-o)-anthracene**



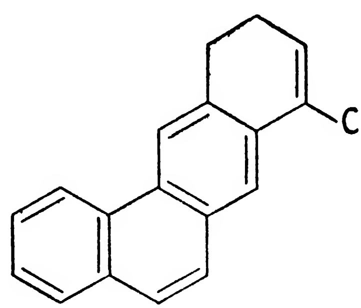

M. P., °C
74–75[4]

**2,3-(3′-Methylcyclohexen-3′-o)-phenanthrene**




M. P., °C
80–80.6[6]

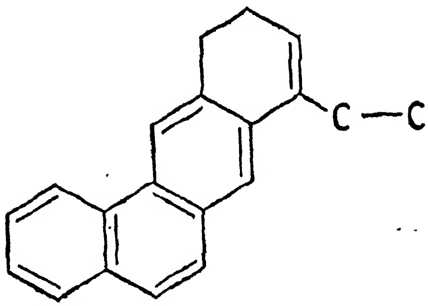
**2,3-(6′-Methylcyclohexen-5′-o)-phenanthrene**




M. P., °C
118–118.5[3]

### $C_{20}H_{18}$

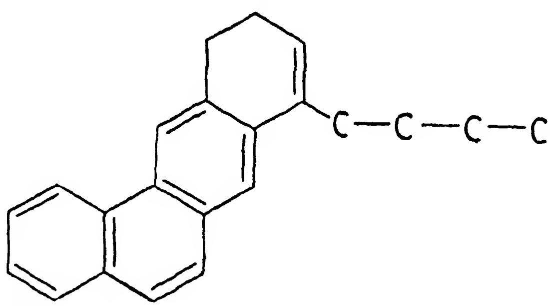
**2,3-(6′-Ethylcyclohexen-5′-o)-phenanthrene**



M. P., °C
110–112[2]
109–110[5]

$C_{22}H_{22}$

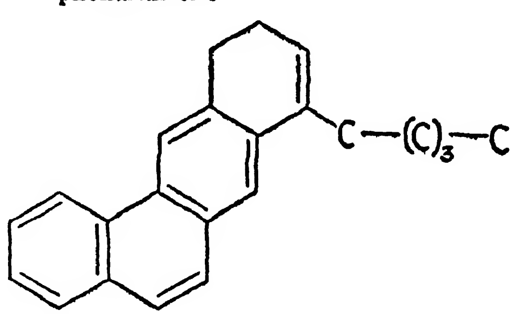
2,3-(6′-*n*-Butylcyclohexene-5′-o)-phenanthrene



M. P., °C
69–70[5]

$C_{23}H_{24}$

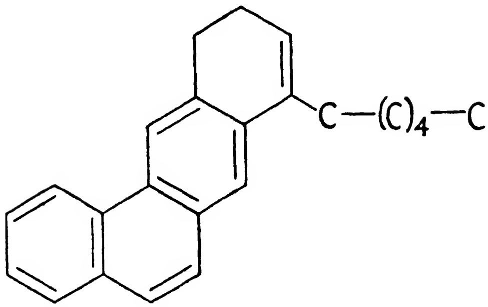
2,3-(6′-*n*-Pentylcyclohexen-5′-o)-phenanthrene



M. P., °C
59–60[5]

$C_{24}H_{26}$

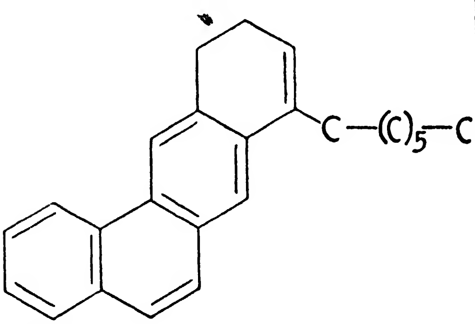
**2,3-(6′-*n*-Hexylcyclohexen-5′-o)-phenanthrene**



M. P., °C
47–48[5]

$C_{25}H_{28}$

**2,3-(6′-*n*-Heptylcyclohexen-5′-o)-phenenthrene**



M. P., °C
53–54[5]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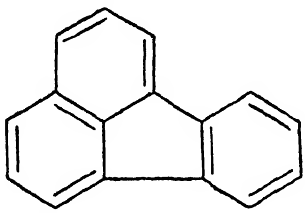
# 4. BENZOFLUORENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-22}$

## $C_{16}H_{10}$

**Benzo-[jk]-fluorene**
(Fluoranthene)
(Idryl)



M. P., °C

**110**
110.0–110.7[9]
110[15, 16, 27, 28]
109–110[31]
109[12, 13, 20, 30]
108–109[25]

B. P., °C @ 760mm

| | |
|---|---|
| 393[10] | |
| 382–383 | 749[22] |
| 250–251 | 60[14] |
| 250 | 60[30] |
| 217 | 30[14] |

$D_4^{20}$

| | |
|---|---|
| 1.0996 | 18.7°[27] |
| 1.1045 | 15.2°[27] |
| 1.236 (a) (solid)[21] | |

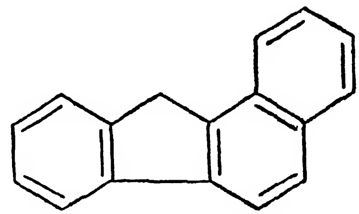
$n_D^{20}$

| | |
|---|---|
| 1.62768 | $n_{H\alpha}^{18.7}$[27] |
| 1.63314 | $n_{H\alpha}^{15.2}$[27] |
| 1.66107 | $n_{H\beta}^{18.7}$[27] |
| 1.66772 | $n_{H\beta}^{15.2}$[27] |
| 1.63693 | $n_{He}^{18.7}$[27] |
| 1.64269 | $n_{He}^{15.2}$[27] |

(a)The temperature of this determination was not given.

## $C_{17}H_{12}$

**1,2-Benzofluorene**
(Chrysofluorene)



M. P., °C

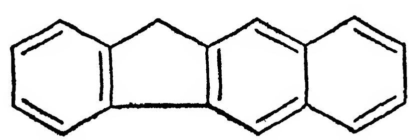
**186.5**
189–190[23]
188[2, 17]
187–188[1]
186–187[18]
186[19]
183–184[6]
182–183[7]
182[8]

B. P., °C @ 760mm

| | |
|---|---|
| 413[17] | |
| 398–400 | 758[23] |

**2,3-Benzofluorene**

(Isonaphthofluorene)



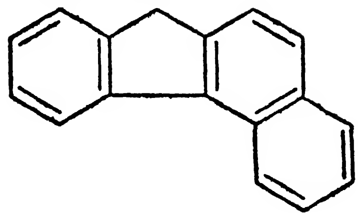
M. P., °C

209[24]
208–209[23]
208[3, 26]

B. P., °C @ 760mm

| | |
|---|---|
| 401–402 | 758[23] |

**3,4-Benzofluorene**



M. P., °C
124–125[5]

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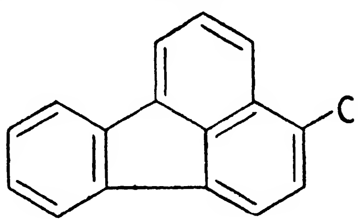
**Benzo-[lm]-2-methylfluorene**

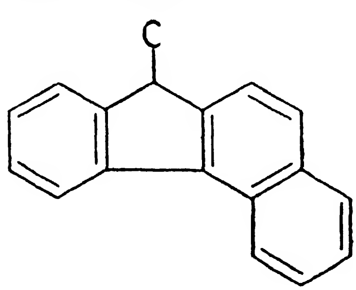


M. P., °C
66[29]

---

## $C_{18}H_{14}$

**3,4-Benzo-9-methylfluorene**

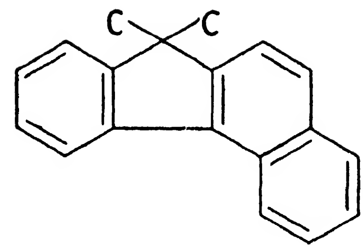


M. P., °C
80.8–82.0[11]

---

## $C_{19}H_{16}$

**3,4-Benzo-9,9-dimethylfluorene**



M. P., °C
148–148.5[4]

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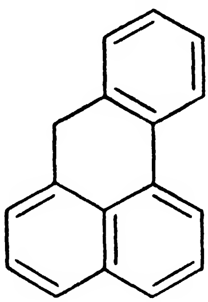
## 6. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-22}$

### $C_{17}H_{12}$

**2,3-Benzophenalan**
(Benzanthrene)
(Isochrysofluorene)



M. P., °C
84[6, 14]
81–82[18]

---

**1,x-Naphthylenephenylenemethane** (a)

M. P., °C
76[38]

(a) The naphthylene bond may be in either the 2- or 8-position.

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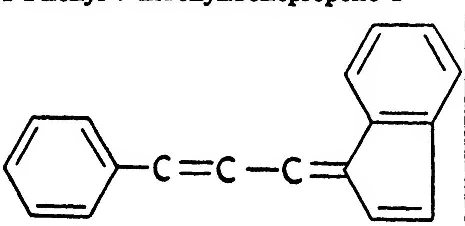
### $C_{18}H_{14}$

**1-Phenyl-3-indenylidenepropene-1**



M. P., °C
190[50]

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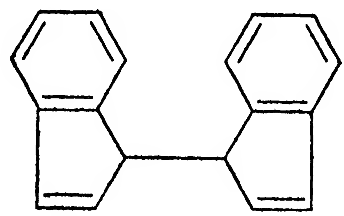
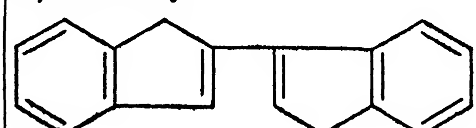
**1,1′-Biindenyl**



M. P., °C
99–100[23, 39]
98[49]

---

**2,3′-Biindenyl**



M. P., °C
57–58[48]
56[46]

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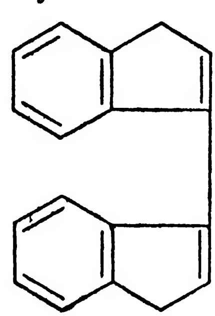
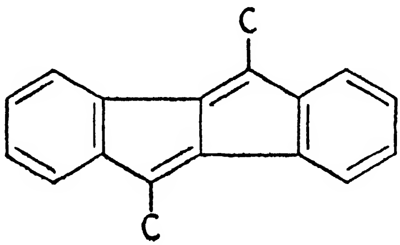
**3,3′-Biindenyl**



M. P., °C
130.5–131.5[19]
130–131.5[49]
129.5–130.5[49]

---

**3,4,7,8-Dibenzo-2,6-dimethyl-bicyclo-[3,3,0]-octadiene-1,5**



M. P., °C
212[11]

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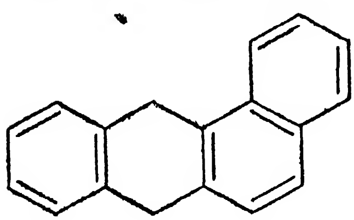
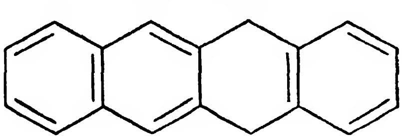
**1,2-Benzo-9,10-dihydroanthracene**



M. P., °C
112–112.5[1]

---

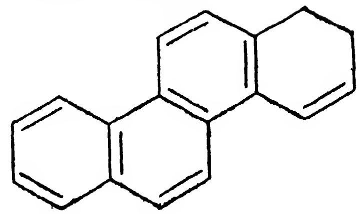
**5,12-Dihydronaphthacene**



M. P., °C
212–213[24]
212[17]
207[28]
206–207[37]

B. P., °C @ 760mm
ca. 400[37]

**1,2-Dihydrochrysene**



M. P., °C
182.5–184.5[4]

---

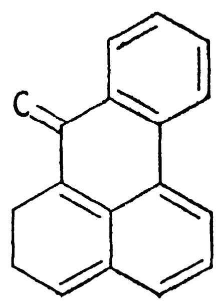
**x,x-Dihydrochrysene** (a)

M. P., °C
167–169[44]

(a) The structure of this compound was not clearly defined in the literature.

---

**2,3-Benzo-1-methylene-8,9-dihydrophenalan**

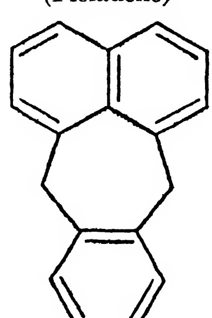


M. P., °C
155–156[12, 13]

---

**Naphtho-[1,8-ab]-benzo-[e]-cycloheptane**

(Pleiadene)

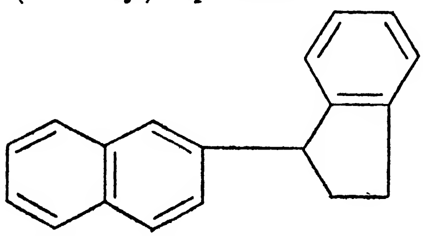


M. P., °C
116.5[45]

---

$C_{19}H_{16}$

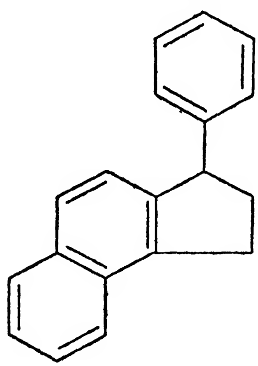
**2-(1′-Indanyl)-naphthalene**



M. P., °C
52–53[21]
47[52]
B. P., °C @ 760mm
229–230 13[52]

---

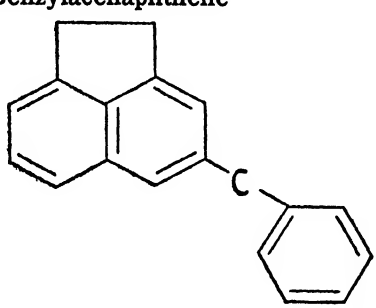
**1-Phenyl-4,5-benzoindane**



M. P., °C
79[52]
B. P., °C @ 760mm
226–229 13[52]

---

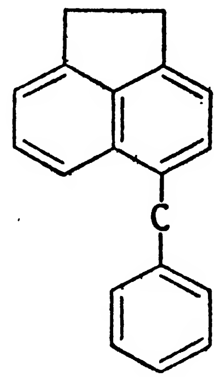
**4-Benzylacenaphthene**



M. P., °C
45–46[26]
B. P., °C @ 760mm
260–265 20[26]

---

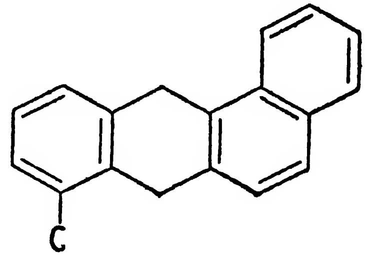
**5-Benzylacenaphthene**



M. P., °C
112–113[25]
111–112[42]
110–111[26, 27]
B. P., °C @ 760mm
ca. 340–315[25]
210–215 13[27]

---

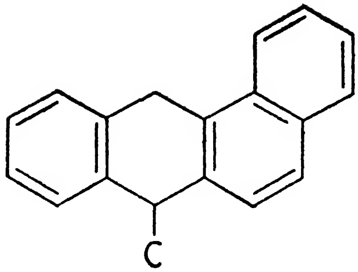
**1,2-Benzo-5-methyl-9,10-dihydro-anthracene**



M. P., °C
128–129.5[3]

---

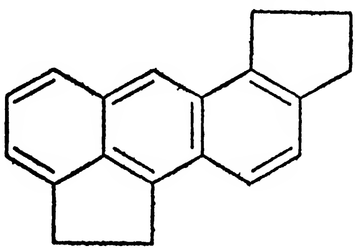
**1,2-Benzo-10-methyl-9,10-dihydro-anthracene**



M. P., °C
94.4–94.9[31]

---

**Dicyclopentano-[a,fg]-anthracene**



M. P., °C
174–176[30]

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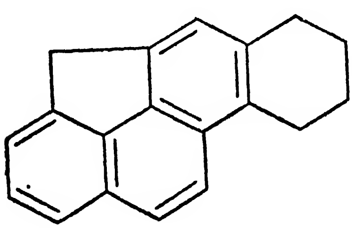
**Cyclopentano-[mno]-1,2,3,4-tetrahydrochrysene**

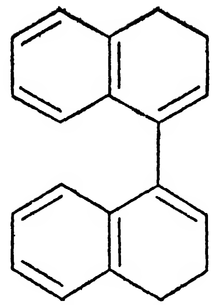


M. P., °C
129–129.4[29]
127.5–128.5[29]

---

## $C_{20}H_{18}$

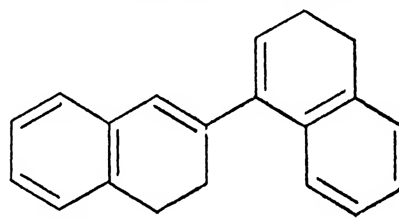
**3,4,3′,4′-Tetrahydro-1,1′-binaphthyl**



M. P., °C
141[54]
140[8]
139–140[47]

---

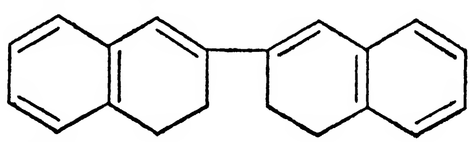
**3,4,3′,4′-Tetrahydro-1,2′-binaphthyl**



M. P., °C
87[53]

---

**3,4,3′4′-Tetrahydro-2,2′-binaphthyl**



M. P., °C
156[51]
153[53]

---

**x,x-Dihydro-x-benzylfluorene** (a)
M. P., °C
71[41]

(a) The structure of this compound was not clearly defined in the literature.

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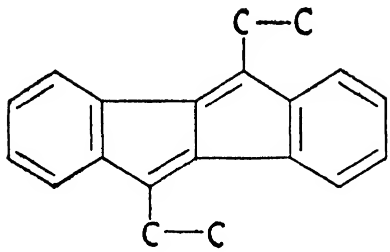
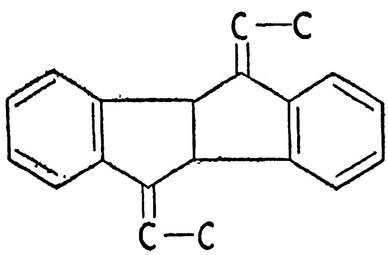
**3,4,7,8-Dibenzo-2,6-diethylbicyclo-[3,3,0]-octadiene-1,5**



M. P., °C
154[11]

---

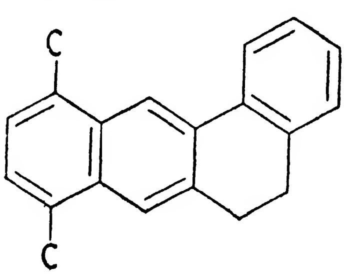
**3,4,7,8-Dibenzo-2,6-diethylidene-bicyclo-[3,3,0]-octane**



M. P., °C
199.5[11]

---

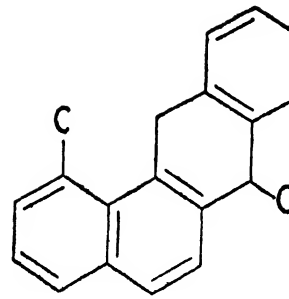
**1,2-Benzo-5,8-dimethyl-3,4-dihydroanthracene**



M. P., °C
82.2–82.8[32]

---

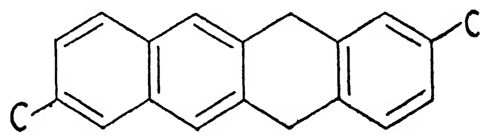
**2,3-Benzo-1,5-dimethyl-1,4-dihydrophenanthrene**



M. P., °C
108–109[35]

---

**2,8-Dimethyl-5,12-dihydronaphthacene**



M. P., °C
217[22]

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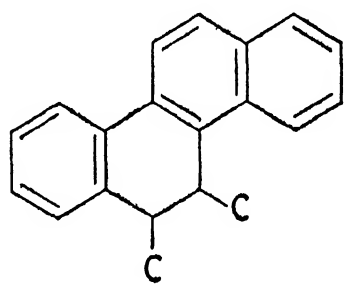
**5,6-Dimethyl-5,6-dihydrochrysene**



M. P., °C
104–104.5[40]

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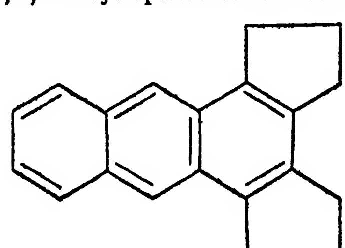
**1,2,3,4-Dicyclopentanoanthracene**



M. P., °C
146[8]

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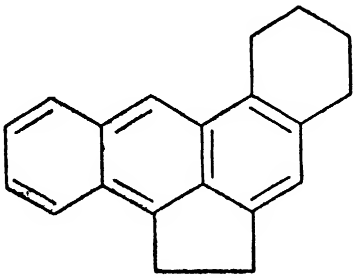
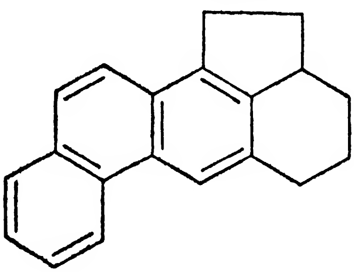
**Cyclohexano-[a]-cyclopentano-[de]-anthracene**



M. P., °C
106–107[34]

---

**2a,3,4,5-Tetrahydrocholanthrene**



M. P., °C
107 (a)[2]
101–101.5 (a)[2]

(a) These constants were determined on different crystalline forms.

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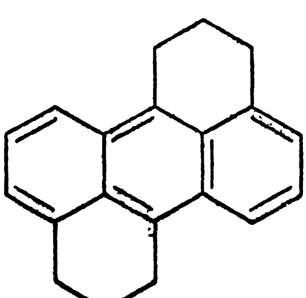
**1,2,3,7,8,9-Hexahydroperylene**



M. P., °C
189[56]
182–185[55]
183–184[57]
183[43]

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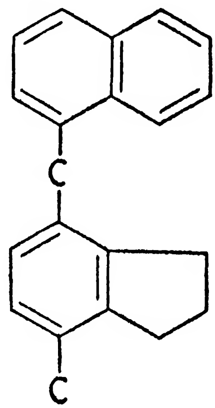
## $C_{21}H_{20}$

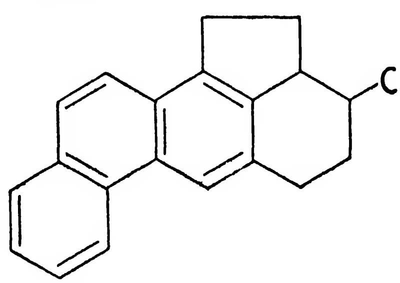
**(1′-Naphthyl)-[4′-(7′-methylindanyl)]-methane**



B. P., °C @ 760mm
221–226 4[33]

---

**3-Methyl-2a,3,4,5-tetrahydrocholanthrene**

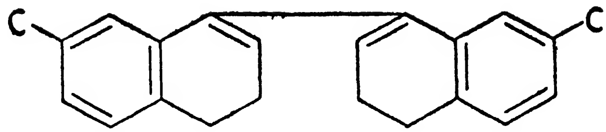


M. P., °C
97–99[9]

---

## $C_{22}H_{22}$

**7,7′-Dimethyl-3,4,3′,4′-tetrahydro-1,1′-binaphthyl**



M. P., °C 162–163[15, 16]

---

**x₈-Octahydro-1,2,3,4-dibenzoanthracene** (a)

M. P., °C
129[7]

(a) The structure of this compound was not clearly defined in the literature.

---

**x₈-Octahydro-1,2,5,6-dibenzoanthracene** (a)

M. P., °C
188–190[19, 20]

(a) The structure of this compound was not clearly defined in the literature.

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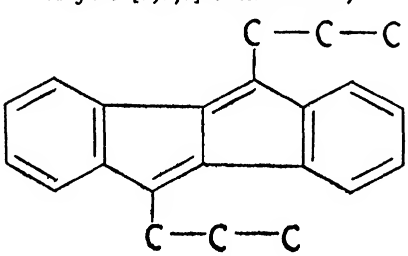
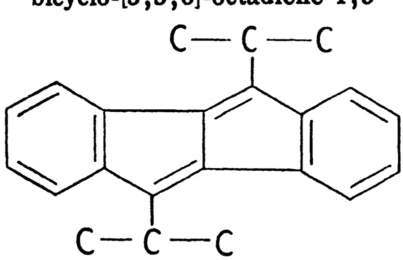
**3,4,7,8-Dibenzo-2,6-di-*n*-propylbicyclo-[3,3,0]-octadiene-1,5**



M. P., °C
135-136[10]

---

**3,4,7,8-Dibenzo-2,6-diisopropylbicyclo-[3,3,0]-octadiene-1,5**



M. P., °C 178–179[10]

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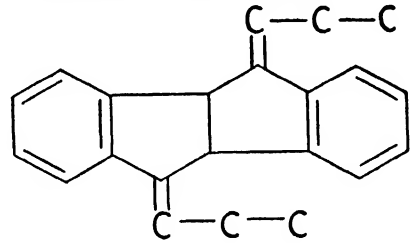
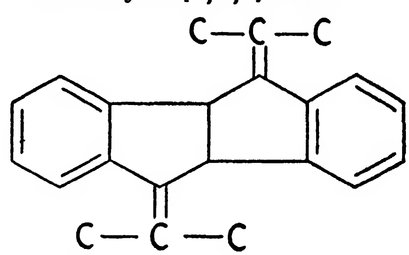
**3,4,7,8-Dibenzo-2,6-di-*n*-propylidenebicyclo-[3,3,0]-octane**



M. P., °C
157–158[10]

---

**3,4,7,8-Dibenzo-2,6-diisopropylidenebicyclo-[3,3,0]-octane**

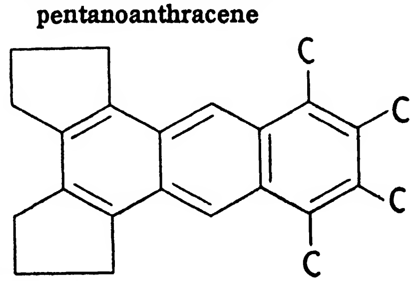


M. P., °C
189[10]

---

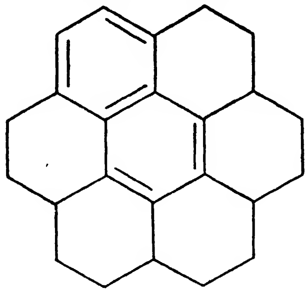
$C_{24}H_{26}$

**1,2,3,4-Tetramethyl-5,6,7,8-dicyclopentanoanthracene**



M. P., °C
296–297[5]

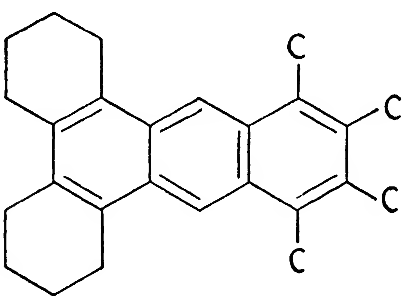
### 1,2,2a,3,4,4a,5,6,6a,7,8,8a,9,10-Tetradecahydrocoronene



M. P., °C
277–278[36]

## $C_{26}H_{30}$

### 1,2,3,4-Tetramethyl-5,6,7,8-dicyclohexanoanthracene



M. P., °C
272–273[5]

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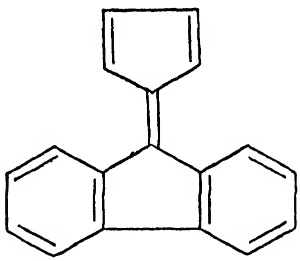
# IX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-24}$

1. Fluorene Derivatives of Empirical Formula $C_nH_{2n-24}$
2. Dihydroanthracenes and Dihydrophenanthrenes with One Phenyl Substitution
3. 1,2-Benzoanthracene and Its Alkyl Derivatives
4. 3,4-Benzophenanthrene and Its Alkyl Derivatives
5. Naphthacene and Its Alkyl Derivatives
6. Chrysene and Its Alkyl Derivatives
7. Triphenylene and Its Alkyl Derivatives
8. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-24}$

## 1. FLUORENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-24}$

### $C_{18}H_{12}$

**9-(Cyclopentadien-2′,4′-ylidene)-fluorene**

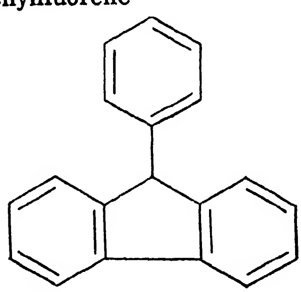


M. P., °C

133–135[7]

### $C_{19}H_{14}$

**9-Phenylfluorene**



M. P., °C

**146**
148.5[17]
147–148[35]
146–148[37]
147[27, 37, 38]
146[1]
145–146[11, 12, 31]
145.5[18, 19, 20]
145 (a)
144[4, 15]

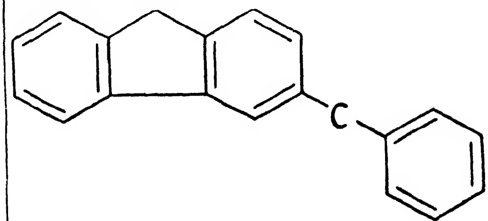
$D_4^{20}$

1.232 0° [41]

(a) The melting point 145 is found in references 23, 24, 25, 28, 30, 33, 40.

### $C_{20}H_{16}$

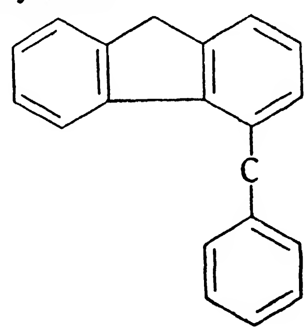
**3-Benzylfluorene**




M. P., °C

106.5[10]
106[8]
104–106[13]
102[14]

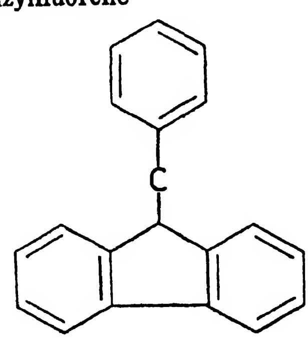
**4-Benzylfluorene**




M. P., °C

77[16]

**9-Benzylfluorene**



M. P., °C

**133**
134–135[39]
134[34]
133[5]
131–132[2]
130–131[32]

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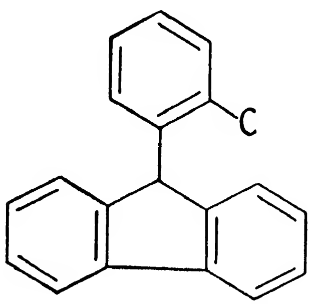
**9-*o*-Tolylfluorene**



M. P., °C

133[36]

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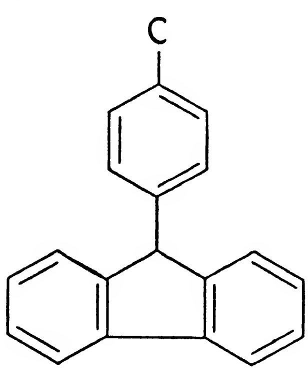
**9-*p*-Tolylfluorene**

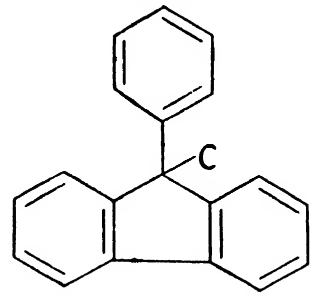


M. P., °C

128 (a)[18]
124[21]

(a) The structure of this compound was not clearly defined in the literature.

**9-Methyl-9-phenylfluorene**



M. P., °C

81-85[3]

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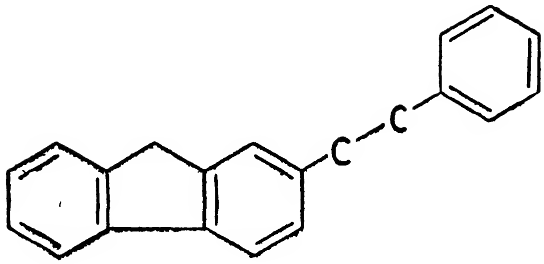
*This series continued on next page*

## $C_{21}H_{18}$

### 2-Phenethylfluorene



M. P., °C
113–114[6]

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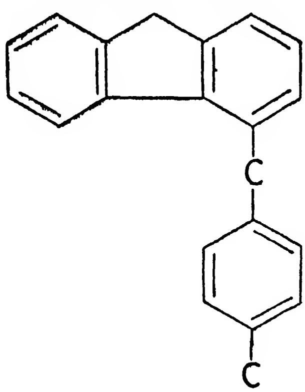
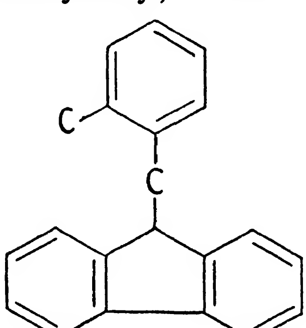
### 4-(4′-Methylbenzyl)-fluorene



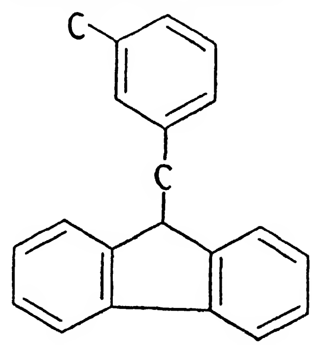
M. P., °C
72[26]

### 9-(2′-Methylbenzyl)-fluorene



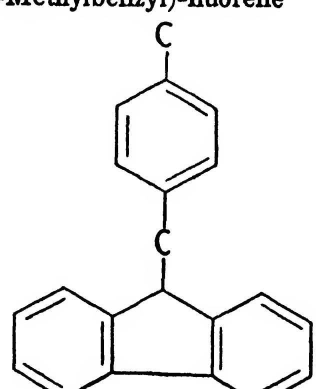
M. P., °C
71–72[29]

### 9-(3′-Methylbenzyl)-fluorene



M. P., °C
111–112[9]

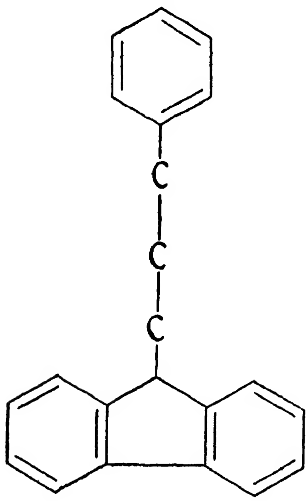
### 9-(4′-Methylbenzyl)-fluorene



M. P., °C
136–137[29]

## $C_{22}H_{20}$

## 1-Phenyl-3-(9′-fluoryl)-propane



M. P., °C
75–76[2]
71[22]

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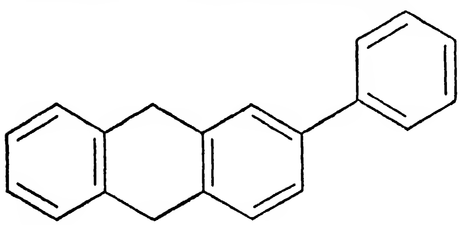
## 2. DIHYDROANTHRACENES AND DIHYDROPHENANTHRENES WITH ONE PHENYL SUBSTITUTION, $C_nH_{2n-24}$

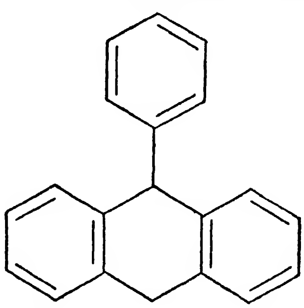
### $C_{20}H_{16}$

**2-Phenyl-9,10-dihydroanthracene**



M. P., °C
93–96[16]

**9-Phenyl-9,10-dihydroanthracene**



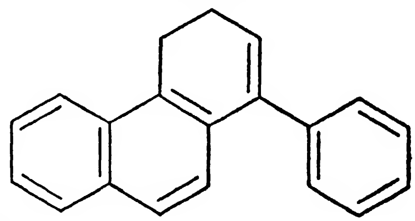
M. P., °C
90–91[11]
90[9]
87[15]

**x-Phenyl-x,x-dihydroanthracene** (a)

M. P., °C
123[15]
120–120.5[17]

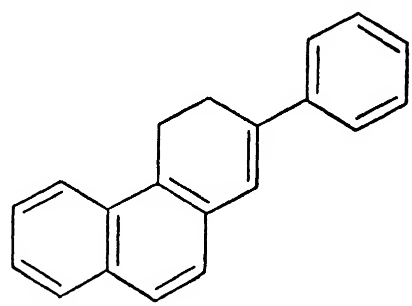
(a) The structure of this compound was not clearly defined in the literature.

**1-Phenyl-3,4-dihydrophenanthrene**



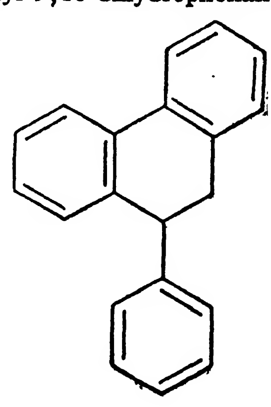
M. P., °C
98[2]

**2-Phenyl-3,4-dihydrophenanthrene**



M. P., °C
150.6–151.0[14]

**9-Phenyl-9,10-dihydrophenanthrene**



M. P., °C
121.5[10]
84[4]

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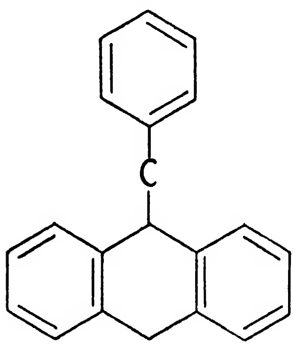
$C_{21}H_{18}$

**9-Benzyl-9,10-dihydroanthracene**



M. P., °C
119-120[6, 7]
110-111[1]

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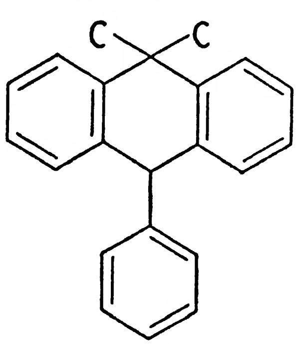
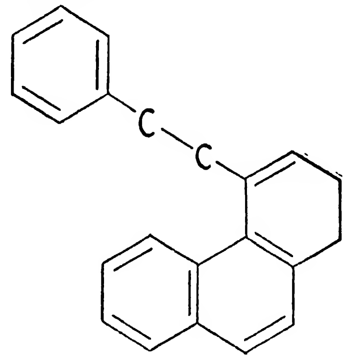
$C_{22}H_{20}$

**9,9-Dimethyl-10-phenyl-9,10-dihydroanthracene**



M. P., °C
145-146[5]

**4-Phenethyl-1,2-dihydrophenanthrene**

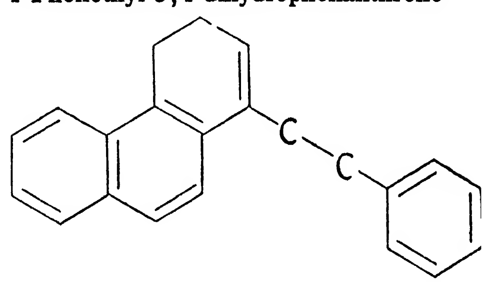


B. P., °C @ 760mm
180 0.01[3]

$n_D^{20}$
1.6510 26° [3]

---

**1-Phenethyl-3,4-dihydrophenanthrene**



M. P., °C
62-63[8]

B. P., °C @ 760mm
185-187 0.5-1[8]

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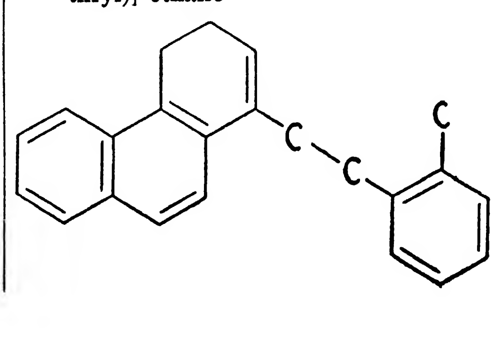
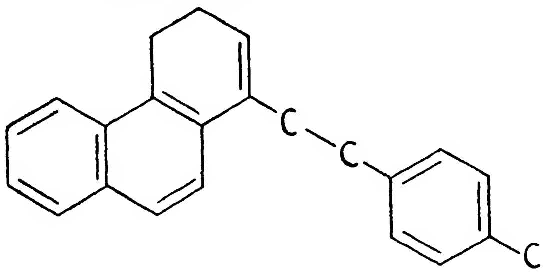
$C_{23}H_{22}$

**1-*o*-Tolyl-2-[1′-(3′,4′-dihydrophenanthryl)]-ethane**



M. P., °C
57–58[8]
B. P., °C @ 760mm
190–195 0.5–1[8]

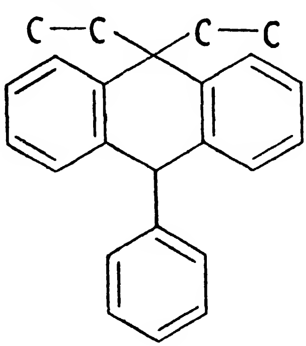
**1-*p*-Tolyl-2-[1′-(3′,4′-dihydrophenanthryl)]-ethane**



M. P., °C
79.5–81[8]
B. P., °C @ 760mm
200–205 0.5–1.0[8]

$C_{24}H_{24}$

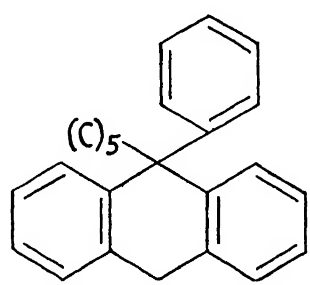
**9,9-Diethyl-10-phenyl-9,10-dihydroanthracene**



M. P., °C
135–136[13]

$C_{25}H_{26}$

**9-Pentyl-9-phenyl-9,10-dihydroanthracene**



M. P., °C
85[12]

*References on Dihydroanthracenes and Dihydrophenanthrenes with One Phenyl Substitution*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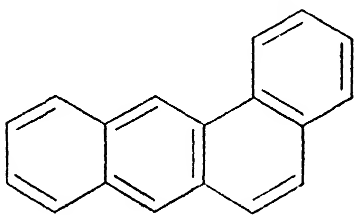
## 3. 1,2-BENZOANTHRACENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-24}$

$C_{18}H_{12}$

**1,2-Benzoanthracene**
(Naphthanthracene)

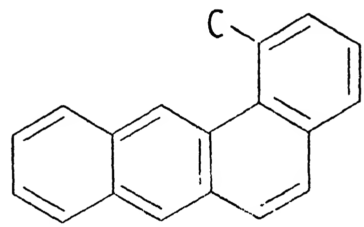


M. P., °C
**159.7**
165–167[17]
161.4–161.8[21]
160.5–161[24]
160–160.5[30]
159.5–160.5[28]
160[41]
159–160[12, 27, 30]
158–160[38, 42]
158.5–159.5[16]
159[9, 36, 39]
158–159[6, 7, 13, 22]
158–158.5[1]
156–157[10]
155–157[23, 35]

$D_4^{20}$
1.245 (solid)[37]

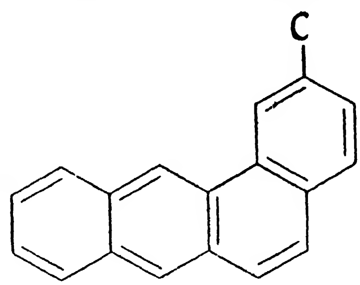
$C_{19}H_{14}$

**1,2-(3′-Methylbenzo)-anthracene**



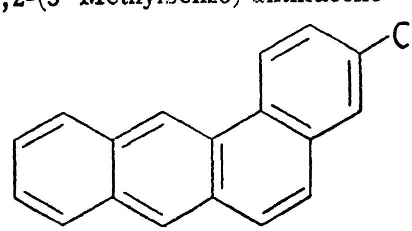
M. P., °C
138.5–139.2[34]
138.5–139.0[21]
135.5–136.5[4]

**1,2-(4′-Methylbenzo)-anthracene**



M. P., °C
149–150[13]
148–149[3]

**1,2-(5′-Methylbenzo)-anthracene**



M. P., °C
160[13]

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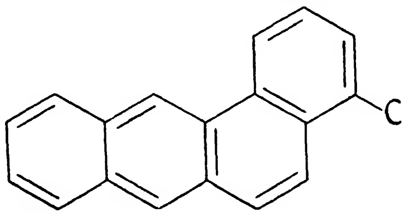
**1,2-(6′-Methylbenzo)-anthracene**



M. P., °C
194–195[19]

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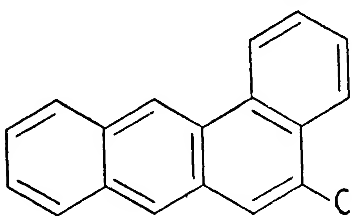
**1,2-Benzo-3-methylanthracene**



M. P., °C
155[18]
153–154[11]

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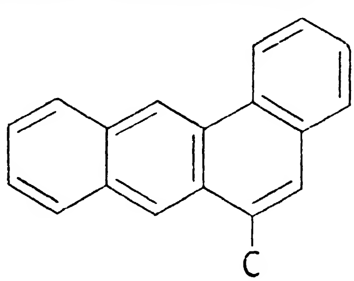
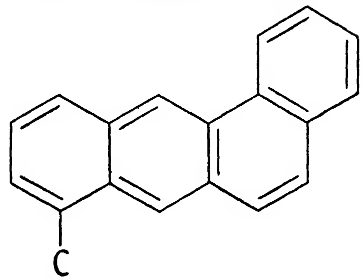
**1,2-Benzo-4-methylanthracene**



M. P., °C
124–126[33]
124.5–125.5[14]
124.1–124.6[32]

**1,2-Benzo-5-methylanthracene**



M. P., °C
**158**
158–159.4[31]
158.5–159.1[33]
157.5–158.5[14]
156.5–157[5]
154–156[23]

$D_4^{20}$
1.231 (solid)[37]

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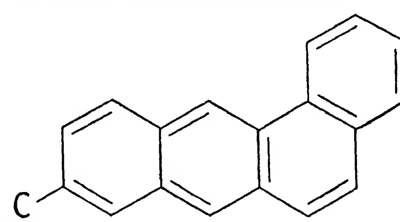
**1,2-Benzo-6-methylanthracene**



M. P., °C
150.5–151.5[13]
149–151.5[2]
127 (a)[22]

(a) The structural formula indicates that this compound has a *para* bond in the 9,10-position.

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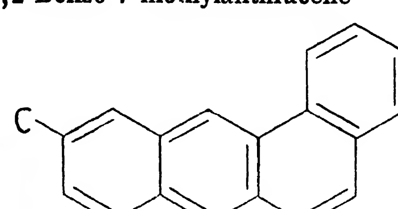
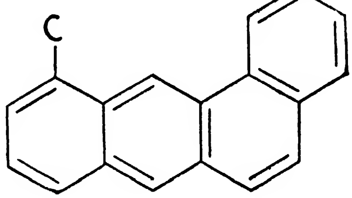
**1,2-Benzo-7-methylanthracene**



M. P., °C

182[13]
181[20]
179.5–181[2]

## 1,2-Benzo-8-methylanthracene



M. P., °C

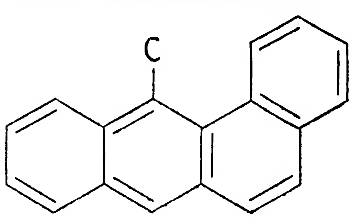
145 (a)[22]
118–118.5 (b)[30]
117–118 (b)[31]
117–118[15]
114–117 (c)[2]

(a) The structural formula indicates that this compound has a *para* bond in the 9,10-position.

(b) This compound remelts at 113.5–114. The substance melting at 113.5–114 is considered a different modification in the literature.

(c) This compound remelts at 112–113.

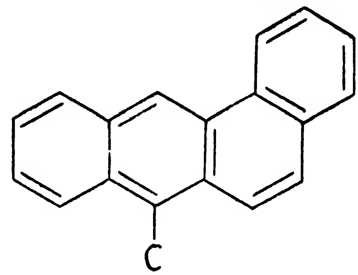
## 1,2-Benzo-9-methylanthracene



M. P., °C

**138.5**
138–139[19]
138.4–138.8[25, 40]
138.0–138.8[21]
137.5–138.5[8]

## 1,2-Benzo-10-methylanthracene



M. P., °C

**140.4**
140.5–141.5[19]
140–141[29]
140.2–140.8[33]
140.0–140.5[21]
139.5–140.5[26]
139–140[3, 27]

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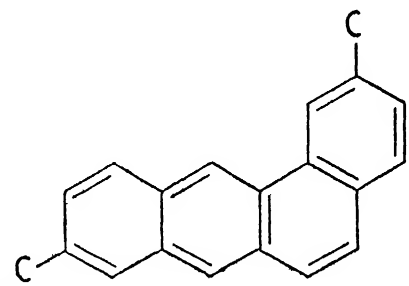
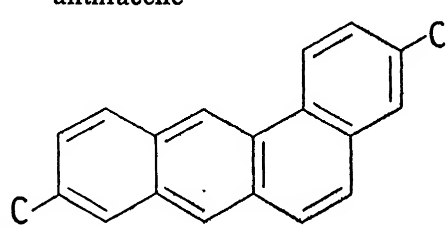
## $C_{20}H_{16}$

### 1,2-(4′-Methylbenzo)-6-methylanthracene



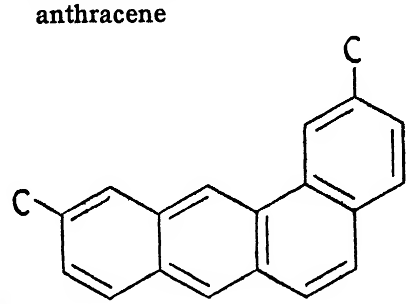
M. P., °C
164[6]

### 1,2-(5′-Methylbenzo)-6-methylanthracene



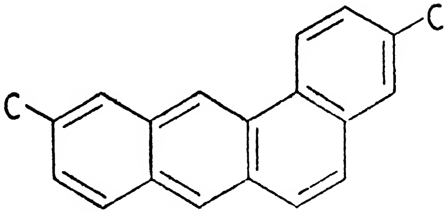
M. P., °C
186–187[6]

### 1,2-(4′-Methylbenzo)-7-methylanthracene



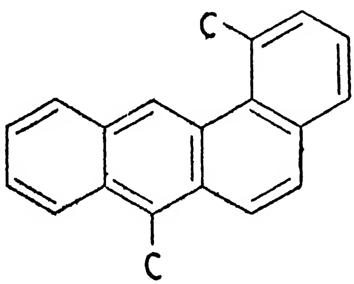
M. P., °C
236[6]

**1,2-(5′-Methylbenzo)-7-methylanthracene**



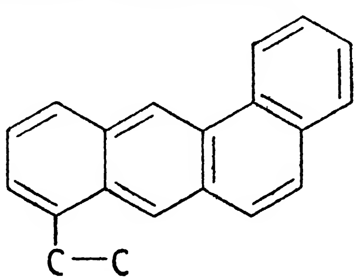
M. P., °C
189–190[6]

**1,2-(3′-Methylbenzo)-10-methylanthracene**



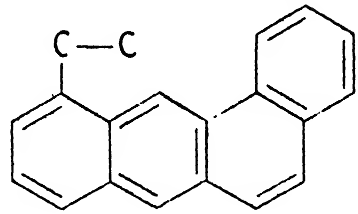
M. P., °C
124–125[21]

**1,2-Benzo-5-ethylanthracene**



M. P., °C
120[12]
118–119[2]

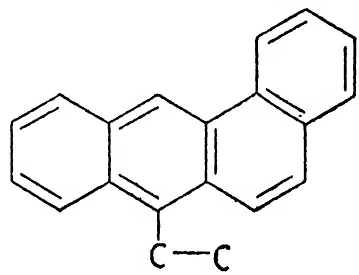
**1,2-Benzo-8-ethylanthracene**



M. P., °C
78–79 (a)[17]

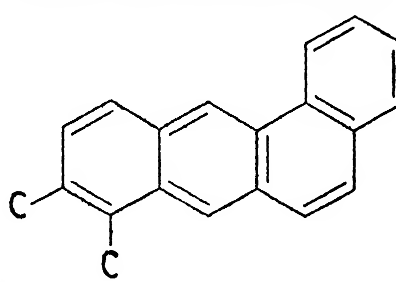
(a) This compound remelts at 82.5–83.

**1,2-Benzo-10-ethylanthracene**



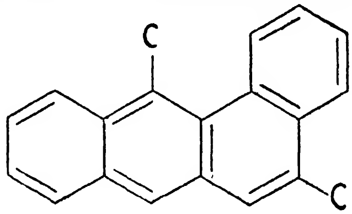
M P., °C
113.5–114[16]
112–113[16]
112.4–112.8[13]

**1,2-Benzo-5,6-dimethylanthracene**



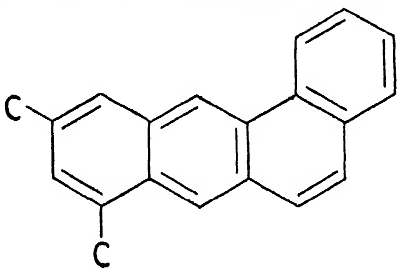
M. P., °C
187–188[3, 9]

**1,2-Benzo-3,9-dimethylanthracene**



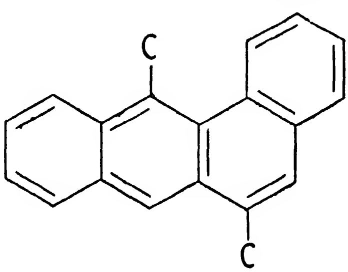
M. P., °C
93–93.5[22]

**1,2-Benzo-5,7-dimethylanthracene**



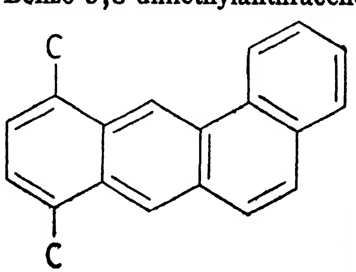
M. P., °C
124.5–125[3]

**1,2-Benzo-4,9-dimethylanthracene**



M. P., °C
75.1–75.5[19]

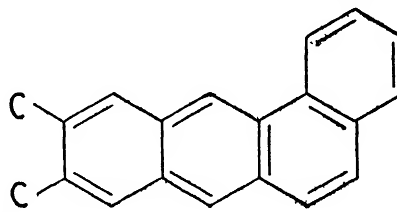
**1,2-Benzo-5,8-dimethylanthracene**



M. P., °C
133.5–134.5[3]
131.2–131.4 (a)[17]

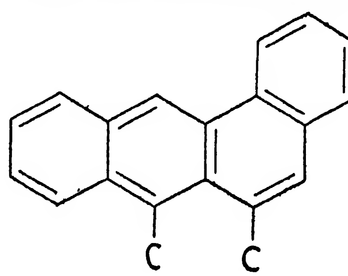
(a) This compound remelts at 134.4–134.7.

**1,2-Benzo-6,7-dimethylanthracene**



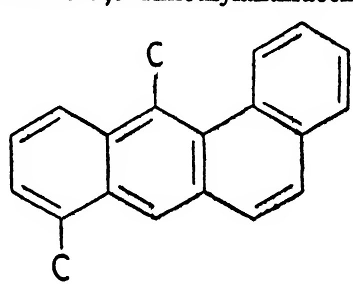
M. P., °C
174[6]
173–174[5]

**1,2-Benzo-4,10-dimethylanthracene**



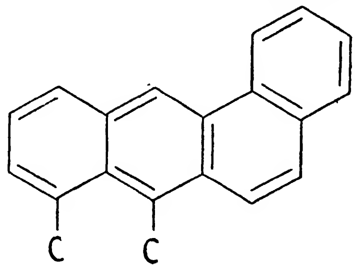
M. P., °C
114–114.4[19]

**1,2-Benzo-5,9-dimethylanthracene**



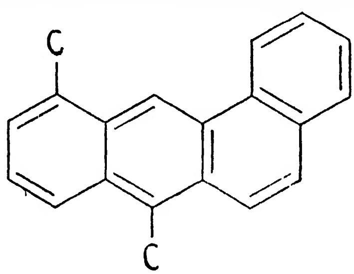
M. P., °C
135.0–135.5[15]
135–135.5[25]

**1,2-Benzo-5,10-dimethylanthracene**



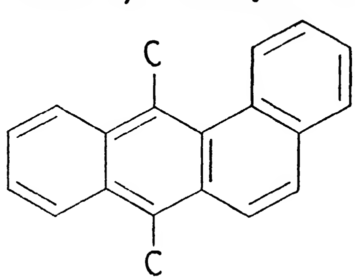
M. P., °C
147–147.5[20]

**1,2-Benzo-8,10-dimethylanthracene**



M. P., °C
145.5–146.5[17]

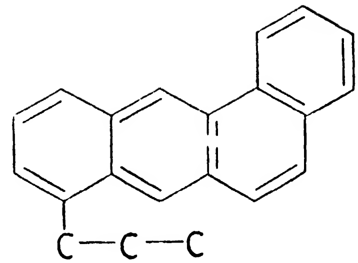
**1,2-Dibenzo-9,10-dimethylanthracene**



M. P., °C
122–123[1, 2, 24]
122.6–122.9[13]
122.4–122.8[26]

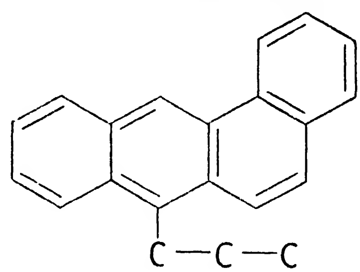
## $C_{21}H_{18}$

**1,2-Benzo-5-*n*-propylanthracene**



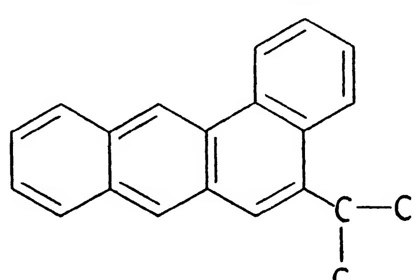
M. P., °C
90–92[2]
91–91.5[10]

**1,2-Benzo-10-*n*-propylanthracene**



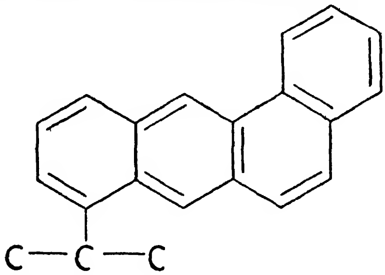
M. P., °C
107–108[16]

**1,2-Benzo-3-isopropylanthracene**



M. P., °C
92[6]

**1,2-Benzo-5-isopropylanthracene**



M. P., °C
111–112[8]

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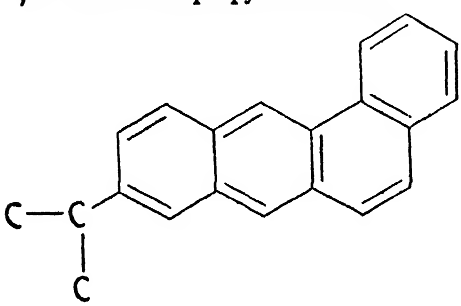
**1,2-Benzo-6-isopropylanthracene**



M. P., °C
132–133[7]
131–132[5, 6]

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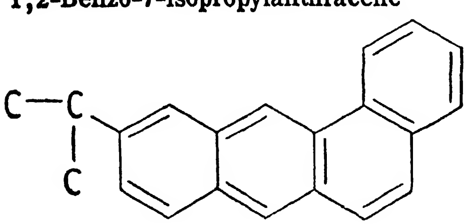
**1,2-Benzo-7-isopropylanthracene**



M. P., °C
125[6]

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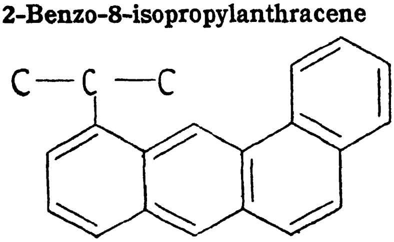
**1,2-Benzo-8-isopropylanthracene**



M. P., °C
97–98[18]

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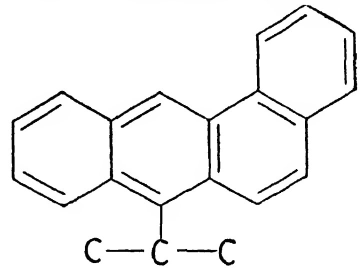
**1,2-Benzo-10-isopropylanthracene**



M. P., °C
94–95[6]
93–93.5[16]

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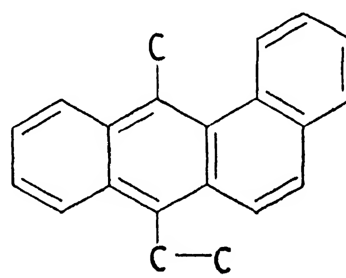
**1,2-Benzo-9-methyl-10-ethylanthracene**



M. P., °C
70–71.5[24]

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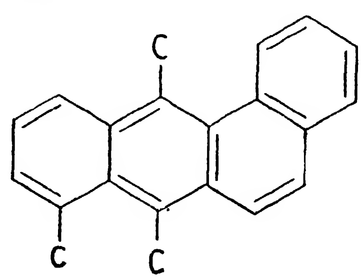
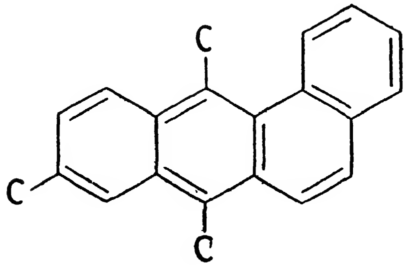
**1,2-Benzo-5,9,10-trimethylanthracene**



M. P., °C
127–128[1, 23]

**1,2-Benzo-6,9,10-trimethylanthracene**



M. P., °C
157–158[4]

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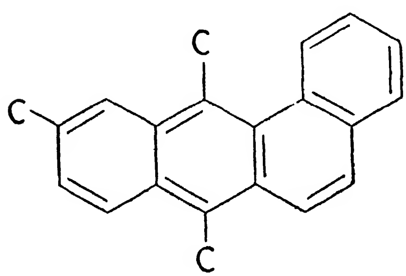
**1,2-Benzo-7,9,10-trimethylanthracene**



M. P., °C
99.5–100[3]

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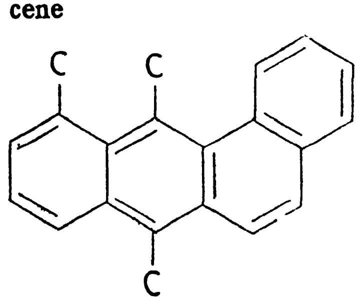
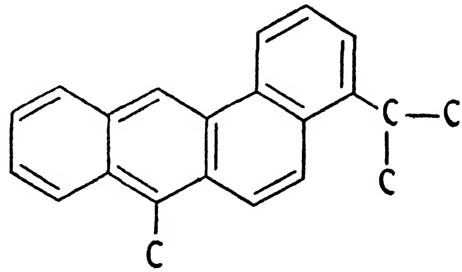
**1,2-Benzo-8,9,10-trimethylanthracene**



M. P., °C
102–103.5[2]

## $C_{22}H_{20}$

**1,2-(6′-Isopropylbenzo)-10-methylanthracene**



M. P., °C
98–99[14]

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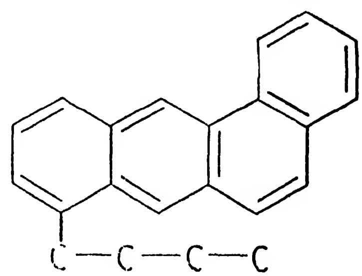
**1,2-Benzo-5-*n*-butylanthracene**



M. P., °C
81[11]

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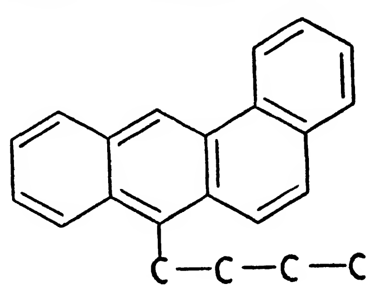
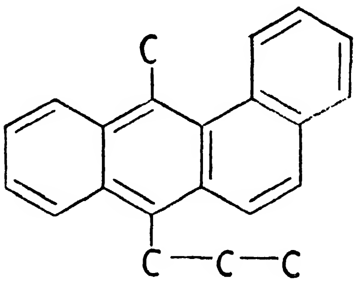
**1,2-Benzo-10-*n*-butylanthracene**



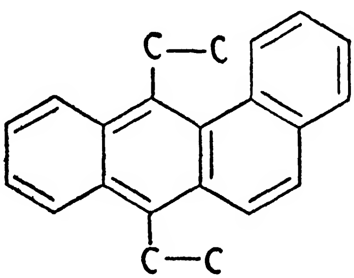
M. P., °C
96.8–97.5[16]
96.4–96.7[18]

1,2-Benzo-9-methyl-10-*n*-propylanthracene



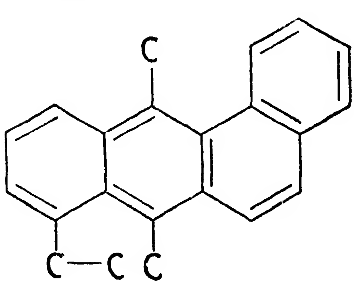
M. P., °C
99–101[24]

1,2-Benzo-9,10-diethylanthracene



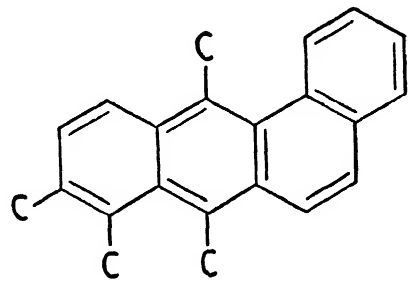
M. P., °C
98.5–99.5[1]

1,2-Benzo-5-ethyl-9,10-dimethylanthracene



M. P., °C
107–108[2]

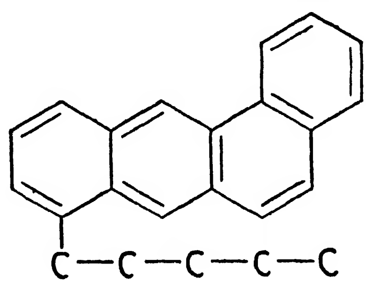
1,2-Benzo-5,6,9,10-tetramethylanthracene



M. P., °C
132–133[4]

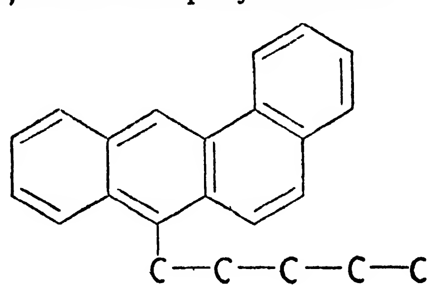
$C_{23}H_{22}$

1,2-Benzo-5-*n*-pentylanthracene



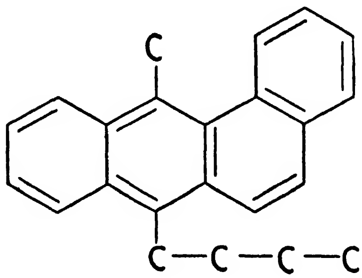
M. P., °C
93[11]

1,2-Benzo-10-*n*-pentylanthracene



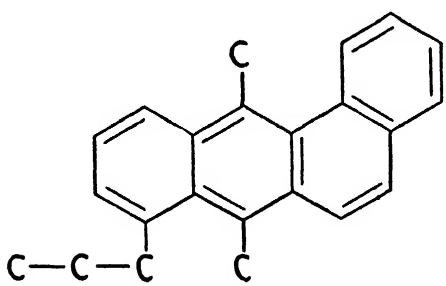
M. P., °C
82.5–83.5[16]
82.6–83.3[13]

**1,2-Benzo-9-methyl-10-*n*-butylanthracene**



M. P., °C
71–72[24]

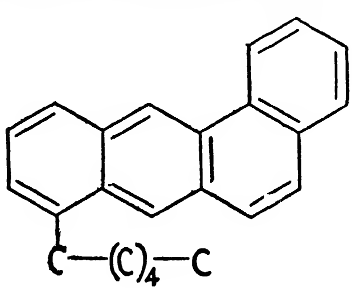
**1,2-Benzo-5-*n*-propyl-9,10-dimethylanthracene**



M. P., °C
84–85[2]

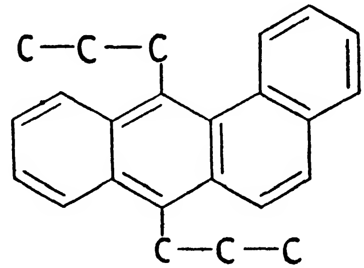
## $C_{24}H_{24}$

**1,2-Benzo-5-*n*-hexylanthracene**



M. P., °C
72–73[11]

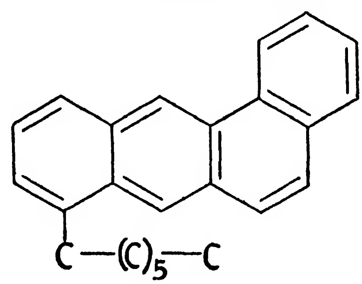
**1,2-Benzo-9,10-di-*n*-propylanthracene**



M. P., °C
100.5–101[2]

## $C_{25}H_{26}$

**1,2-Benzo-5-*n*-heptylanthracene**



M. P., °C
68[11]

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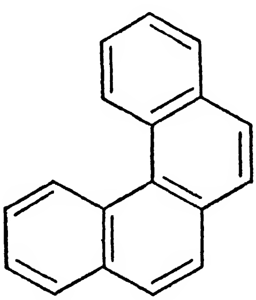
## 4. 3,4-BENZOPHENANTHRENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-24}$

### $C_{18}H_{12}$

**3,4-Benzophenanthrene**



M. P., °C
68[2]
65.6–66.2[8]

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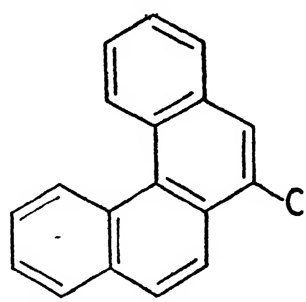
### $C_{19}H_{14}$

**3,4-Benzo-1-methylphenanthrene**




M. P., °C
77–78[7]

B. P., °C @ 760mm
210 0.4[7]

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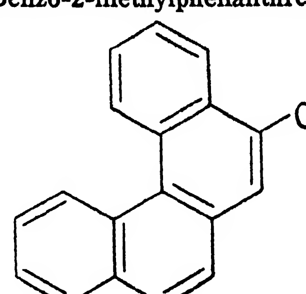
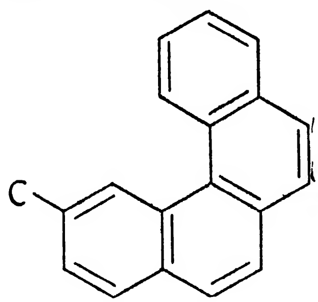
**3,4-Benzo-2-methylphenanthrene**



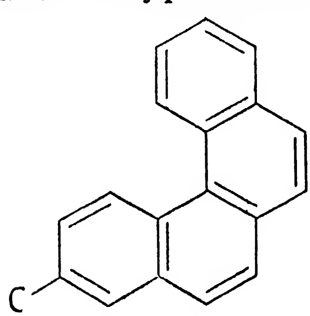
M. P., °C
69.5–70[5]

3,4-Benzo-6-methylphenanthrene



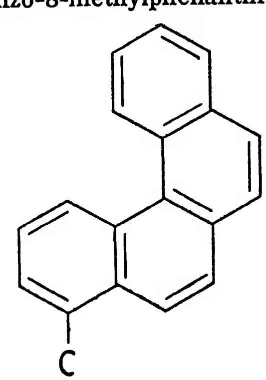
M. P., °C
80–81[6]

3,4-Benzo-7-methylphenanthrene



M. P., °C
54–54.5[6]

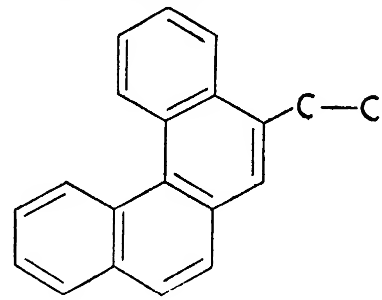
3,4-Benzo-8-methylphenanthrene



M. P., °C
65–66[6]

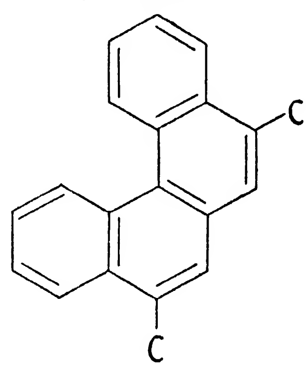
$C_{20}H_{16}$

3,4-Benzo-2-ethylphenanthrene



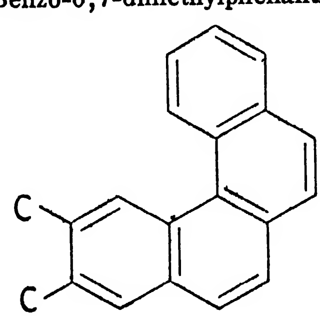
M. P., °C
50.4–51.2[9]

3,4-Benzo-2,9-dimethylphenanthrene



M. P., °C
130.6–131.0[8]

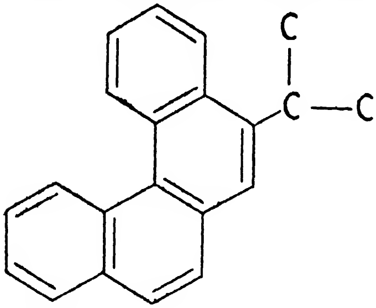
3,4-Benzo-6,7-dimethylphenanthrene



M. P., °C
94.5–95.0[4]
94.5–95[3]

$C_{21}H_{18}$

**.3,4-Benzo-2-isopropylphenanthrene**

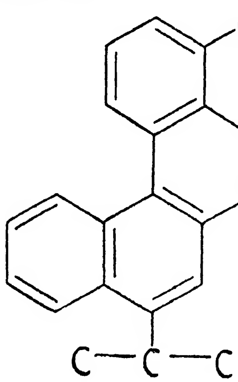


M. P., °C

91.5–92.5[7]

$C_{22}H_{20}$

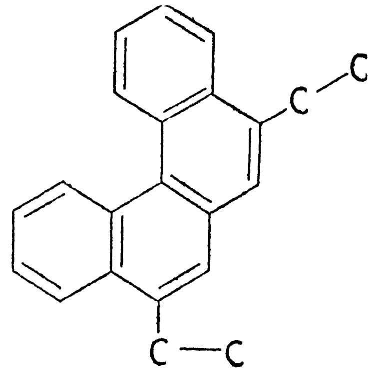
**3,4-(6′-Methylbenzo)-9-isopropylphenanthrene**



M. P., °C

98–99[1]

**3,4-Benzo-2,9-diethylphenanthrene**



M. P., °C

106.4–107.0[8]

*References on 3,4-Benzophenanthrene and Its Alkyl Derivatives*

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## 5. NAPHTHACENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-24}$

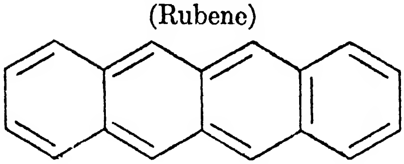
$C_{18}H_{12}$

**Naphthacene**

(Tetracene)

(Chrysogene)

(Rubene)



M. P., °C

**343**

357[3, 8]

349[12]

341.5–343.0[7]

341[1, 2]

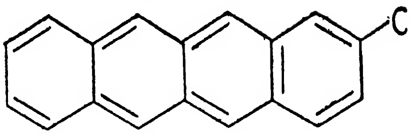
337[14, 15]

335–336[9]

335[11, 13]

### $C_{19}H_{14}$

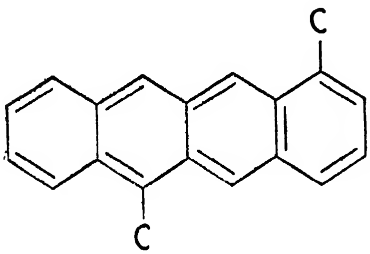
**2-Methylnaphthacene**



M. P., °C
350[6]

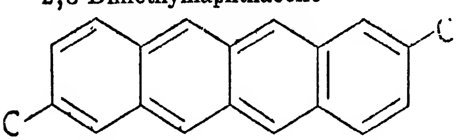
### $C_{20}H_{16}$

**1,6-Dimethylnaphthacene**



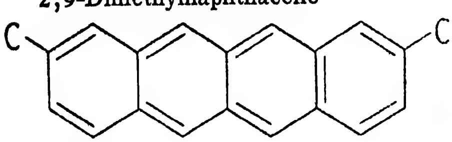
M. P., °C
138 139[10]

**2,8-Dimethylnaphthacene**



M. P., °C
365[5,6]

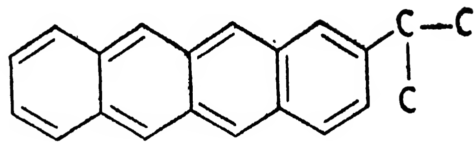
**2,9-Dimethylnaphthacene**



M. P., °C
362[6]

### $C_{21}H_{18}$

**2-Isopropylnaphthacene**



M. P., °C
273 274[4]

*References on Naphthacene and Its Alkyl Derivatives*

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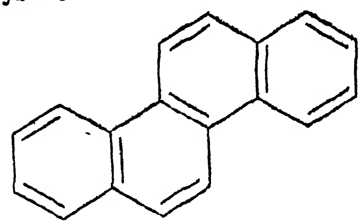
## 6. CHRYSENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-24}$

### $C_{18}H_{12}$

**Chrysene**



M. P., °C

**252**
255–256[73]
255[61, 66]
254.5–255[8, 12, 25]
254.1–254.4[9]
253.2–254.2[50]
254[37, 46]
253–254[59]
253.2–253.8[20]
252.5[53]
252[57]
251–252[62]
251[71]
250 (a)
249–250[23]
248–250[13, 34]
247.5–249.5[7]
249[24, 74]
248–249[17, 18, 62]
247–249[4]
246–248.5[63]
248[36, 39, 54, 56, 68, 69]
247–248[1, 62]
246–248[21]
247[16]
245[40, 67, 72]

B. P., °C @ 760mm

448[41, 44, 65]
436.0[35]

$D_4^{20}$

1.273 (solid)[8]
1.274 (solid)[8, 42]

Additional Data

| Sublimation Temp. (°C) | |
|---|---|
| 190 | 20mm[30] |
| 169 | in vac.[41] |

(a) The melting point 250 is found in references 6, 11, 15, 22, 30, 33, 41, 43, 47, 51, 52, 58, 64, 70, 75.

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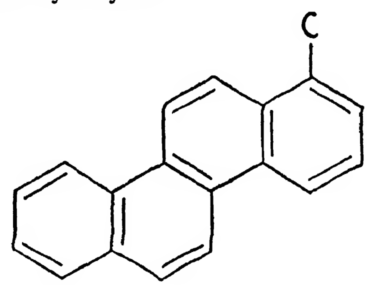
### $C_{19}H_{14}$

**1-Methylchrysene**




M. P., °C

249.5–250[5]

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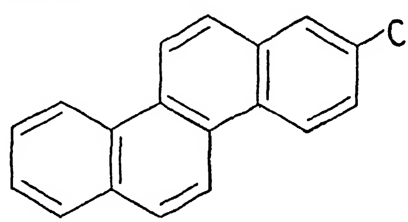
**2-Methylchrysene**




M. P., °C

229–230[4]

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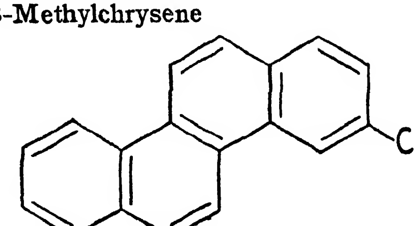
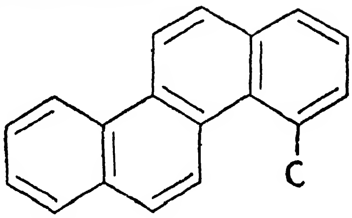
**3-Methylchrysene**




M. P., °C

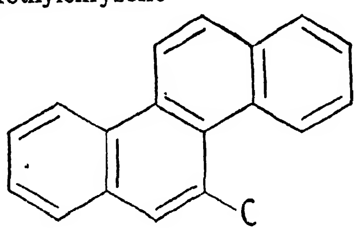
170–170.5[5]

### 4-Methylchrysene



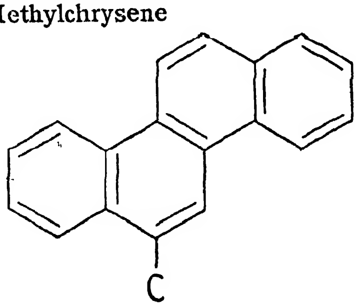
M. P., °C
151–151.5[4, 27]
151[39]
149–149.5[5]

### 5-Methylchrysene



M. P., °C
**117.8**
118–118.8[2]
118 118.5[3]
117.3–117.7[20]
116.8–117.6[28]
115–117[49]

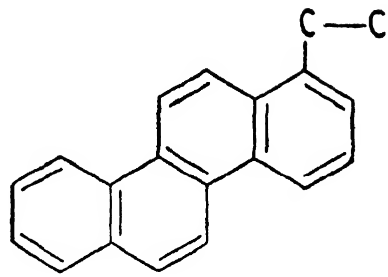
### 6-Methylchrysene



M. P., °C
**160.4**
161.0–161.4[48]
160.4–160.9[20]
159–159.8[29]
159.5[14]

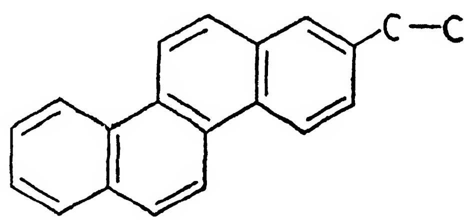
## $C_{20}H_{16}$

### 1-Ethylchrysene



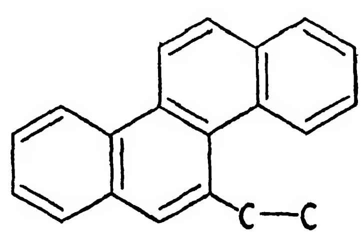
M. P., °C
236[31]
183.5–184[5]

### 2-Ethylchrysene



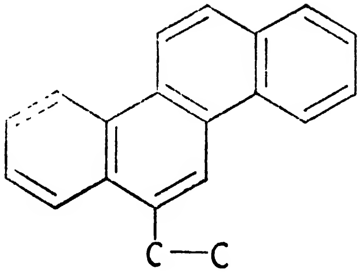
M. P., °C
126[31, 32]

### 5-Ethylchrysene



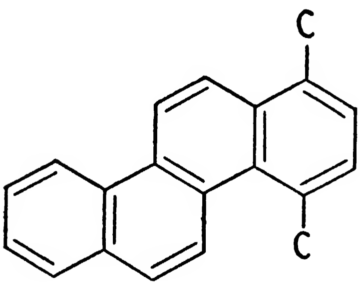
M. P., °C
88–90[49]

**6-Ethylchrysene**



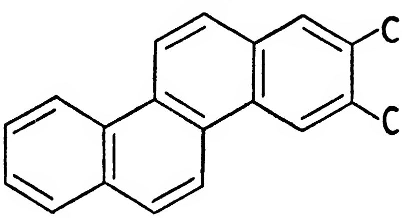
M. P., °C
126.4–126.8[48]

**1,4-Dimethylchrysene**



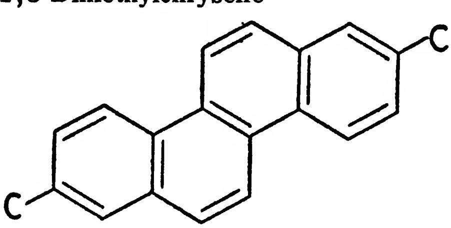
M. P., °C
141.5–142.5[5]

**2,3-Dimethylchrysene**



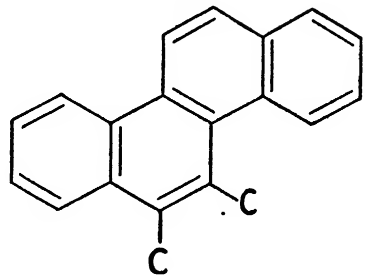
M. P., °C
215–215.3[25]

**2,8-Dimethylchrysene**



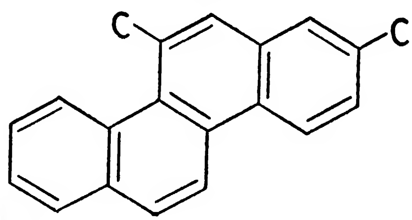
M. P., °C
218[55]

**5,6-Dimethylchrysene**



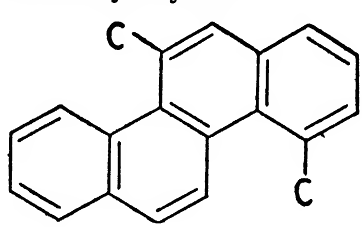
M. P., °C
128.6–129.8[49]
128.5–129.2[20]
127–128[58]

**2,11-Dimethylchrysene**



M. P., °C
237[45]

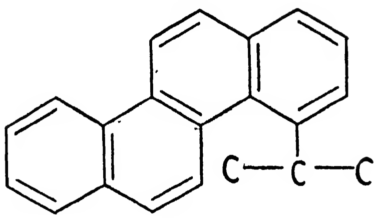
**4,11-Dimethylchrysene**



M. P., °C
147–147.5[26]

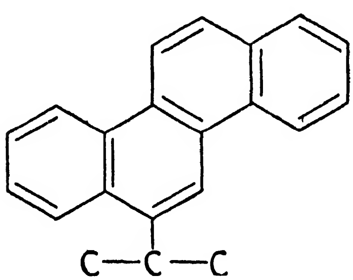
$C_{21}H_{18}$

**4-Isopropylchrysene**



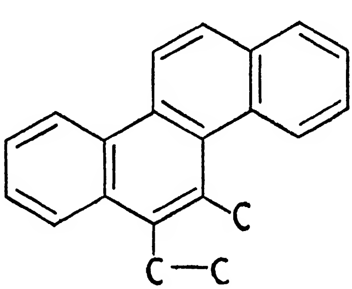
M. P., °C
227[19]

**6-Isopropylchrysene**



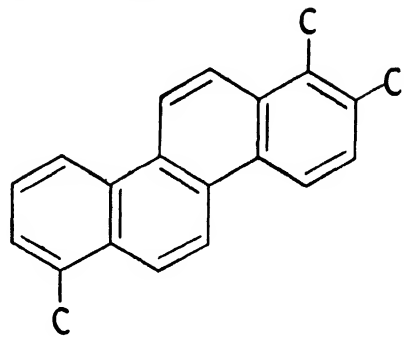
M. P., °C
137[10]

**5-Methyl-6-ethylchrysene**



M. P., °C
125.5–126.5[14]

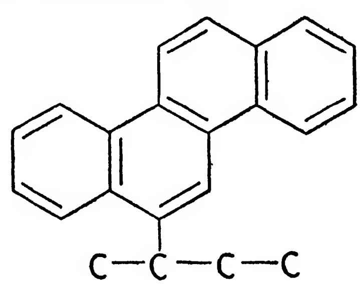
**1,2,7-Trimethylchrysene**



M. P., °C
281–282[60]

$C_{22}H_{20}$

**6-*sec*-Butylchrysene** (a)



M. P., °C
100[10]

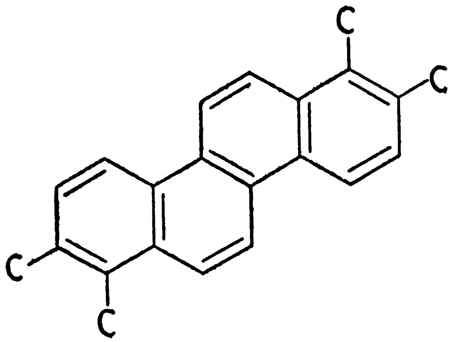
(a) The structure of this compound was not clearly defined in the literature.

**x,x-Diethylchrysene** (a)

M. P., °C
145[32]

(a) The structure of this compound was not clearly defined in the literature.

## 1,2,7,8-Tetramethylchrysene



M. P., °C
298–299[60]

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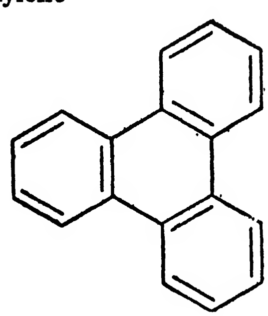
## 7. TRIPHENYLENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-24}$

### $C_{18}H_{12}$

**Triphenylene**

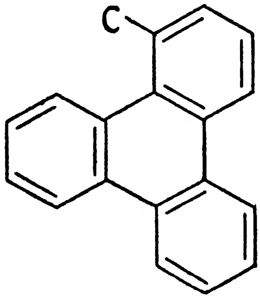


M. P., °C
**198**
200[5]
199[1]
198–198.5[11, 18]
198[4, 12]
197.7–198[17]
197.5–197.9[7]
196.5–197.5[3]
197[16]
196–197[13, 14]
196.5[10]
196[11, 15]
195[6]

B. P., °C @ 760mm
425[1]

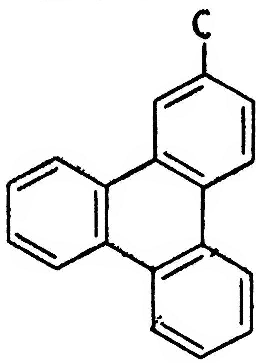
$C_{19}H_{14}$

**1-Methyltriphenylene**



M. P., °C
93.4–94.2[9]
93–94[3]

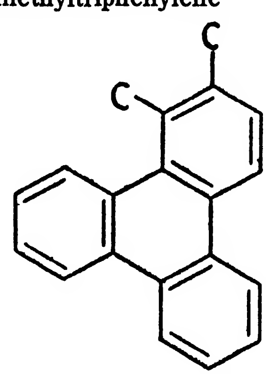
**2-Methyltriphenylene**



M. P., °C
102.6–103.6[9]
101–102[2]

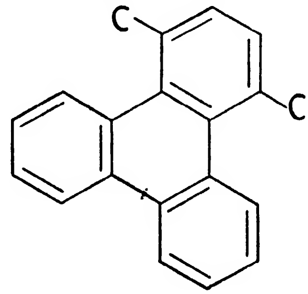
$C_{20}H_{16}$

**1,2-Dimethyltriphenylene**



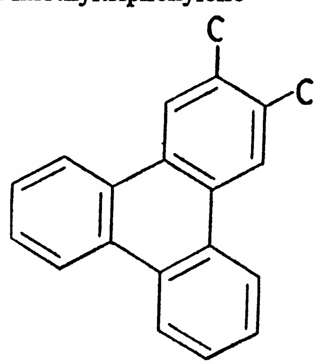
M. P., °C
86.8–87.4[9]

**1,4-Dimethyltriphenylene**



M. P., °C
108.4–109.2[9]

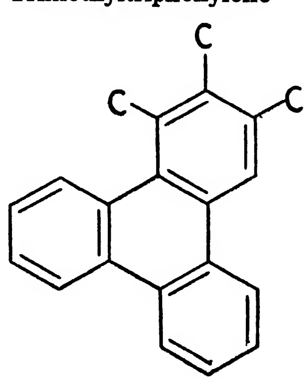
**2,3-Dimethyltriphenylene**



M. P., °C
156.7–157.2[8]

$C_{21}H_{18}$

**1,2,3-Trimethyltriphenylene**



M. P., °C
109.8–110.6[8]

*References on Triphenylene and Its Alkyl Derivatives*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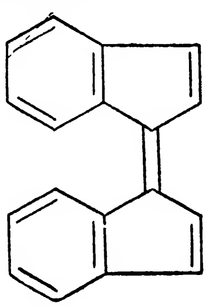
## 8. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-24}$

### $C_{18}H_{12}$

**1,1′-Biindenylidene**

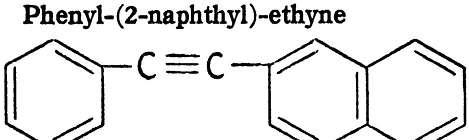


M. P., °C
232–235 (a)[47]

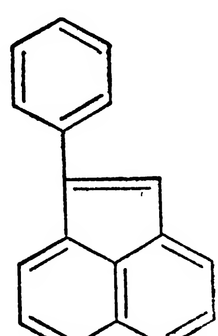
(a) This compound melts with decomposition.

M. P., °C
117[37]
115–116[38]

**Phenyl-(2-naphthyl)-ethyne**

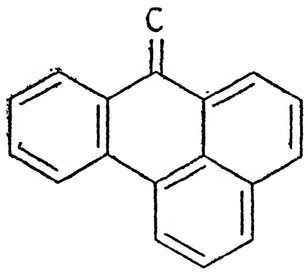


**1-Phenylacenaphthylene**



M. P., °C
54–55[33]

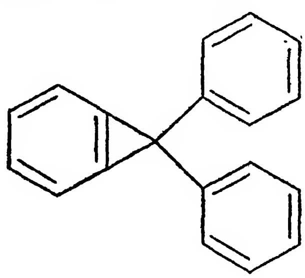
**Benzo-[de]-9-methyleneanthracene**



M. P., °C
225[13, 14]

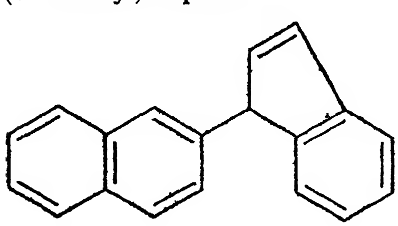
## $C_{19}H_{14}$

**1,1-Diphenyl-2,3-benzocyclopropane**



M. P., °C
144[44, 45]
138[34]

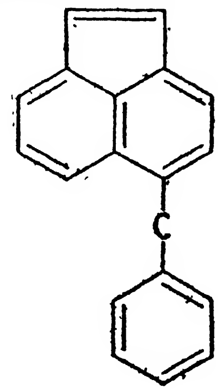
**2-(1′-Indenyl)-naphthalene**



M. P., °C
88[50]
87[16]

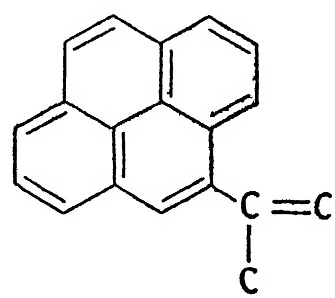
B. P., °C @ 760mm
246–250 14[50]

**5-Benzylacenaphthylene**



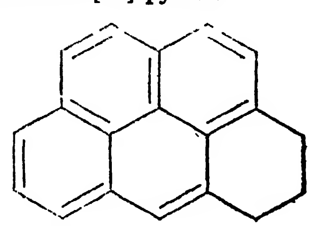
M. P., °C
104–105[20]

**3-Isopropenylpyrene**



M. P., °C
61.5–62.5[23, 24]

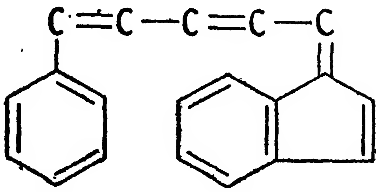
**Cyclohexano-[cd]-pyrene**



M. P., °C
107–108[48]

## $C_{20}H_{16}$

**1-Phenyl-5-(1′-indenylidene)-pentadiene-1,3**



M. P., °C
182–183[1]

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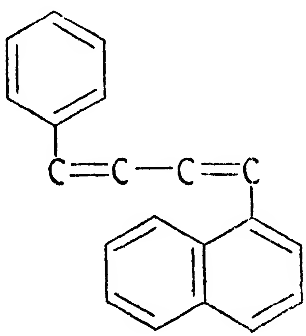
**1-Phenyl-4-(1′-naphthyl)-butadiene-1,3**



M. P., °C
109[30]

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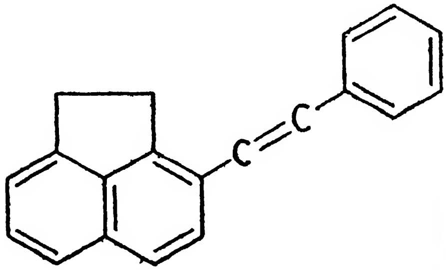
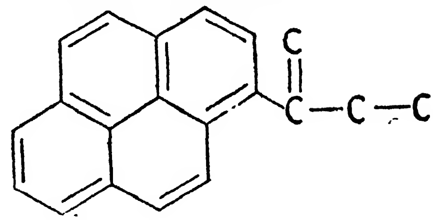
**3-Phenethenylacenaphthene**



M. P., °C
93.2–94.0[35]

**3-(2′-Buten-1′-yl)-pyrene**



M. P., °C
75-76[25]

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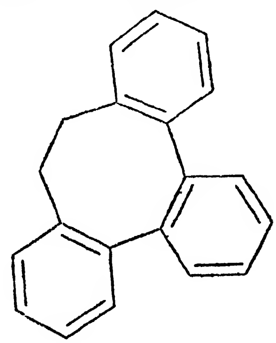
**1,2,3,4,5,6-Tribenzocyclooctane**



M. P., °C
111–113[46]

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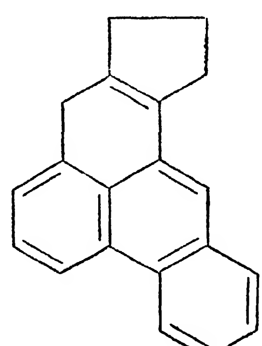
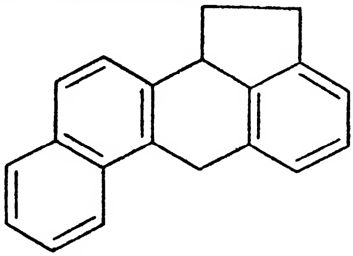
**2,3-Cyclopentano-5,6-benzophenalene**



M. P., °C
144.5–145[29]

**6,12b-Dihydrocholanthrene**



M. P., °C
161.5–162.5[3]

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**Cyclopentano-[x,x]-x,x-dihydrochrysene (a)**

M. P., °C
153.2–153.5[27]

(a) The structure of this compound was not clearly defined in the literature.

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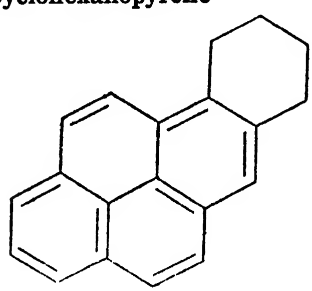
**1,2-Cyclohexanopyrene**



M. P., °C
135[52]
128[36]

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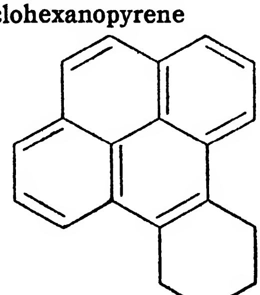
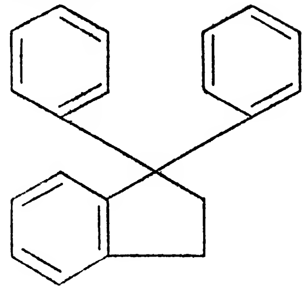
**4,5-Cyclohexanopyrene**



M. P., °C
113[26]

$C_{21}H_{18}$

**1,1-Diphenylindane**



M. P., °C
67–68[31]
67[32]

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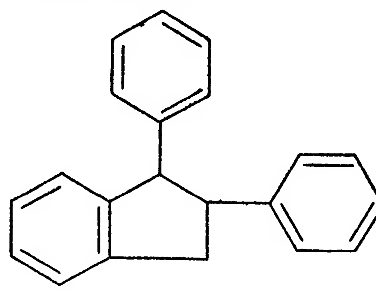
**1,2-Diphenylindane**



M. P., °C
123–124.5 (a)[8]
89 (a)[8]

(a) These constants were determined on isomeric forms.

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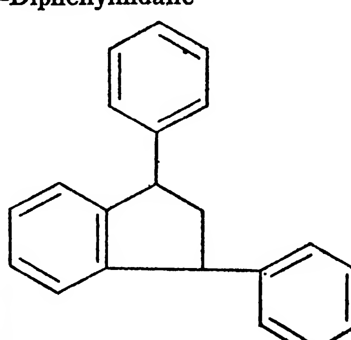
**1,3-Diphenylindane**



M. P., °C
156–157[41, 54]
155–156[42]

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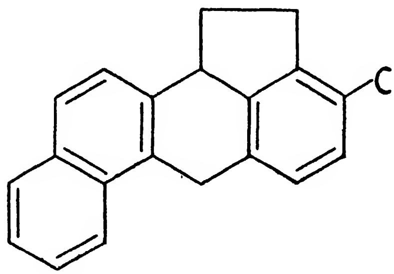
*meso*-3-Methyl-6,12b-dihydrocholanthrene



M. P., °C
138–139[28]

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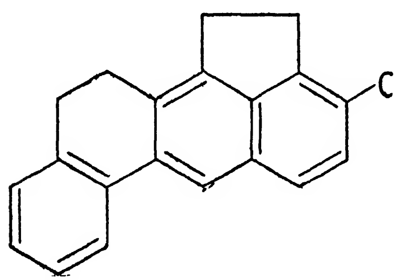
3-Methyl-11,12-dihydrocholanthrene



M. P., °C
154.5–155[28]

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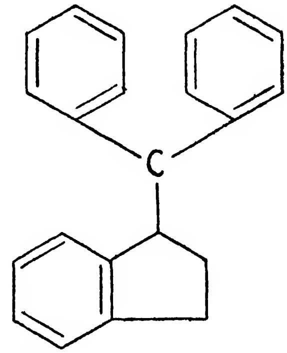
3-Methyl-x,x-dihydrocholanthrene (a)

M. P., °C
136–137[2]

(a) The structure of this compound was not clearly defined in the literature.

$C_{22}H_{20}$

1-Benzhydrylindane



M. P., °C
85–86[18]

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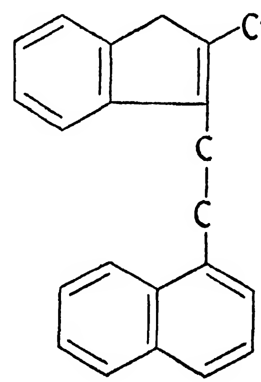
1-(1′-Naphthyl)-2-[3″-(2″-methylindenyl)]-ethane



M. P., °C
99–99.5[4]

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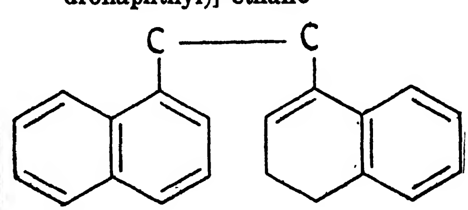
1-(1′-Naphthyl)-2-[1″-(3″,4″-dihydronaphthyl)]-ethane



B. P., °C @ 760mm

225–227 1[39]

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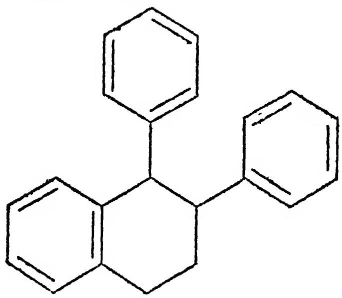
**1,2-Diphenyl-1,2,3,4-tetrahydronaphthalene**



B. P., °C @ 760mm

183–184 1.5[10]

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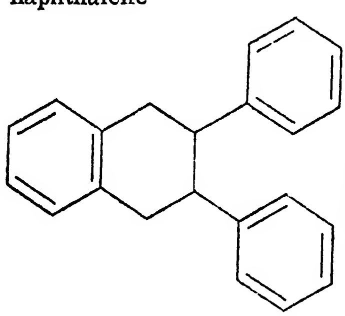
**2,3-Diphenyl-1,2,3,4-tetrahydronaphthalene**



M. P., °C

129–129.5[19]

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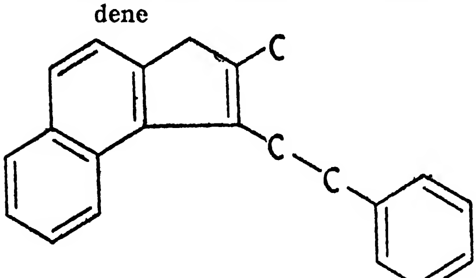
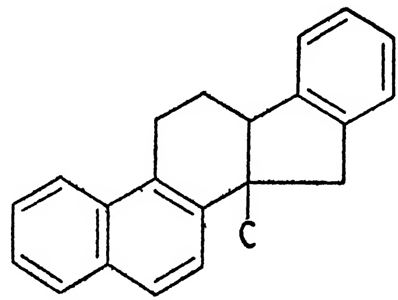
**2-Methyl-3-phenethyl-4,5-benzoindene**



B. P., °C @ 760mm

190–195 0.4[15]

**1-Methyl-1,2-(2′,3′-indano)-1,2,3,4-tetrahydrophenanthrene**



M. P., °C

111–112[4]

B. P., °C @ 760mm

190–195 0.2[4]

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**Cyclopentano-[hi]-2,3-dimethyl-x,x-dihydrochrysene** (a)

M. P., °C

193.5–194.5[27]

(a) The structure of this compound was not clearly defined in the literature.

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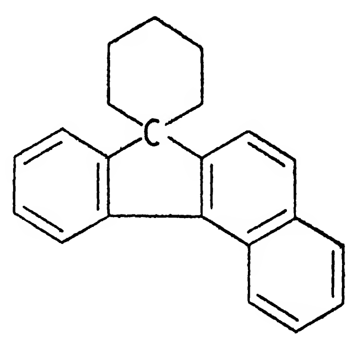
**Spiro[3,4-benzofluorene-9,1′-cyclohexane]**

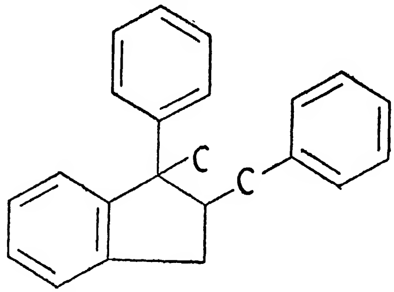


B. P., °C @ 760mm

225–230 0.05[9]

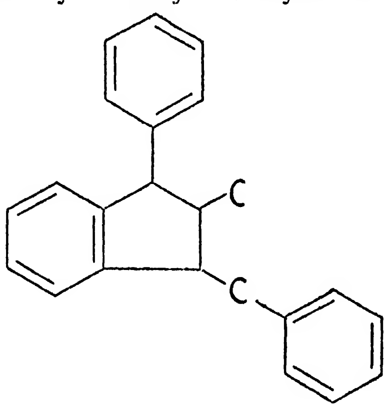
$C_{23}H_{22}$

**1-Methyl-1-phenyl-2-benzylindane**



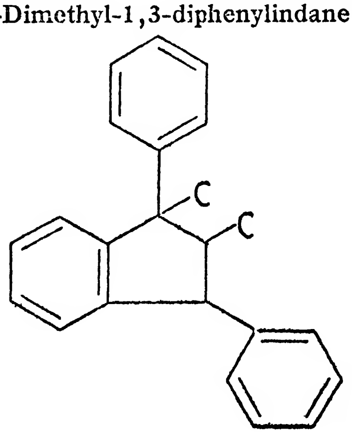
M. P., °C
117–118.5[11]

**1-Phenyl-2-methyl-3-benzylindane**



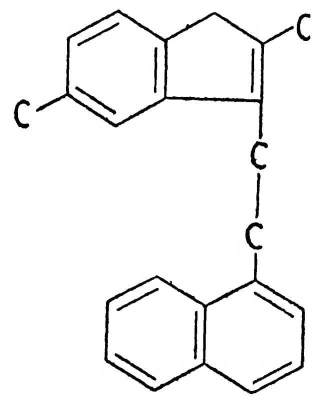
B. P., °C @ 760mm
212-215 16[8]

**1,2-Dimethyl-1,3-diphenylindane**



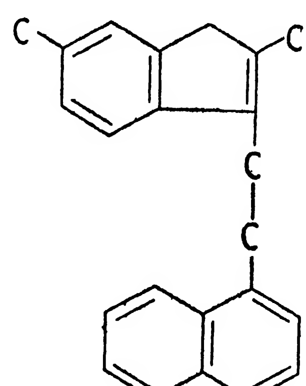
M. P., °C
97.5–98.5[11]

**1-(1′-Naphthyl)-2-[3″-(2″,5″-dimethylindenyl)]-ethane**



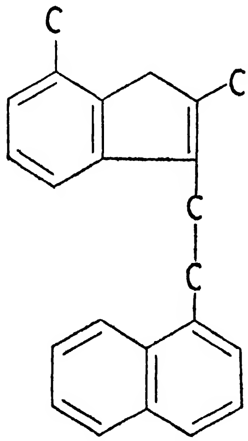
M. P., °C
81–81.5[4]

**1-(1′-Naphthyl)-2-[3″-(2″,6″-dimethylindenyl)]-ethane**



B. P., °C @ 760mm
184–186 0.05[4]

1-(1′-Naphthyl)-2-[3″-(2″,7″-dimethylindenyl)]-ethane



M. P., °C
96[4]

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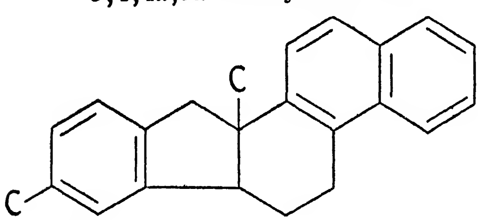
1,2-(2′,1′-Naphtho)-6,9a-dimethyl-3,4,4a,9a-tetrahydrofluorene



M. P., °C
106.5–107[4]

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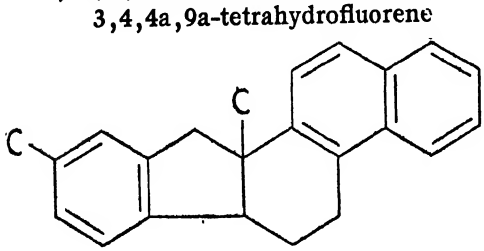
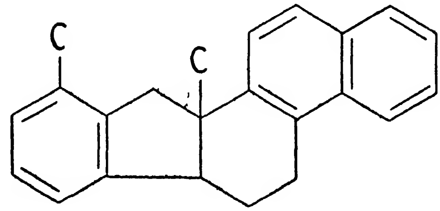
1,2-(2′,1′-Naphtho)-7,9a-dimethyl-3,4,4a,9a-tetrahydrofluorene



M. P., °C
134.5–135[4]

1,2-(2′,1′-Naphtho)-8,9a-dimethyl-3,4,4a,9a-tetrahydrofluorene



M. P., °C
121–122[4]

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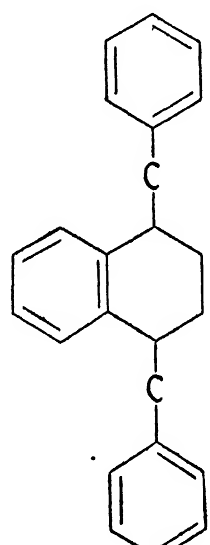
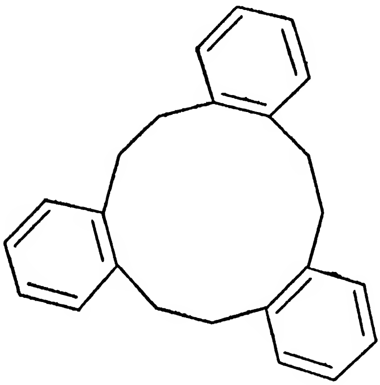
$C_{24}H_{24}$

1,4-Dibenzyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
92–93[21]

**1,2,5,6,9,10-Tribenzocyclododecane**



M. P., °C
184.5[7]

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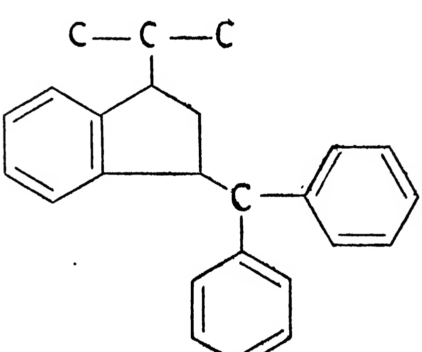
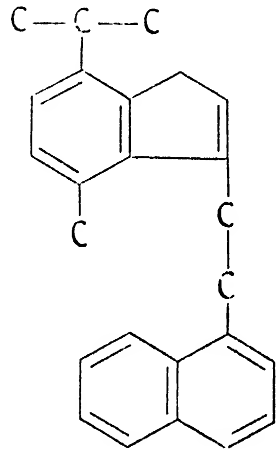
$C_{25}H_{26}$

**1-Isopropyl-3-benzhydrylindane**



M. P., °C
126.5–127.5[53]

**1-(1′-Naphthyl)-2-[3″-(4″-methyl-7″-isopropylindenyl)]-ethane**



M. P., °C
92–93[17]

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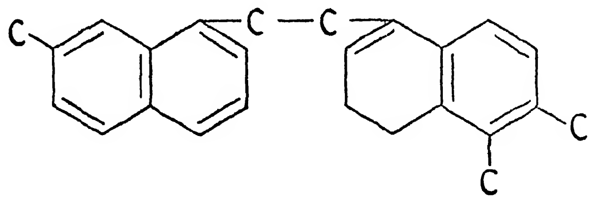
*This series continued on next page*

**1-[1′-(7′-Methylnaphthyl)]-2-[1″-(5″,6″-dimethyl-3″,4″-dihydronaphthyl)]-ethane**



| B. P., °C @ 760mm | |
|---|---|
| 215–217 | 0.3[40] |

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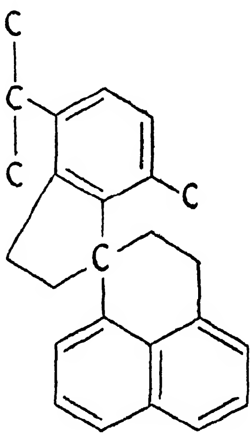
**Spiro[4-isopropyl-7-methylindane-1,1′-phenalan] (a)**



M. P., °C
82–83[17]

(a) The above formula was given for this compound, but the name given in the literature was "7-methyl-4-isopropylhydrindene-1,7′-spiro-7′,8′-dihydrophenalene."

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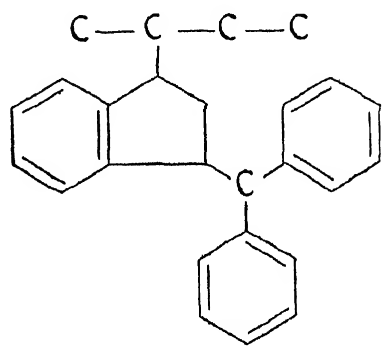
## $C_{26}H_{28}$

**1-*sec*-Butyl-3-benzhydrylindane**



M. P., °C
104–106[53]

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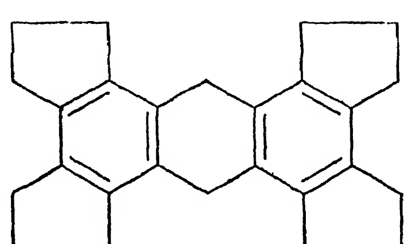
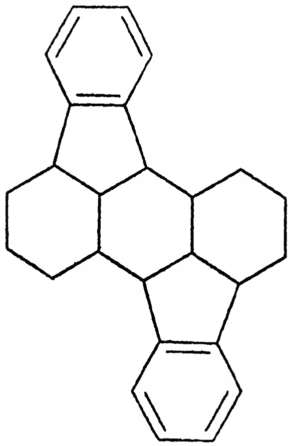
**1,2,3,4,5,6,7,8-Tetracyclopentano-9,10-dihydroanthracene**



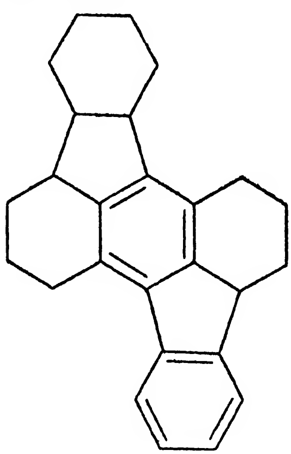
M. P., °C
377–378[6]

**Diindano-[3′,2′,1′-de,3″,2″,1″-kl]-tetradecahydroanthracene**



M. P., °C
246–248[49]

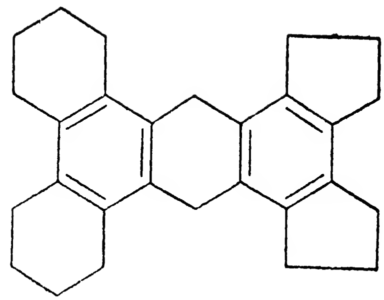
**Indo-[1′,2′,3′-de]-(3a″,4″,5″,6″,7″,7a″-hexahydroindo)-[1″,2″,3″-kl]-1,2,3,4,5,6,7,8-octahydroanthracene**



M. P., °C
271–273[49]

## $C_{28}H_{32}$

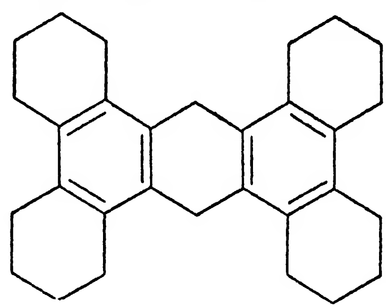
**1,2,3,4-Dicyclopentano-5,6,7,8-dicyclohexano-9,10-dihydroanthracene**



M. P., °C
333–334[5]

## $C_{30}H_{36}$

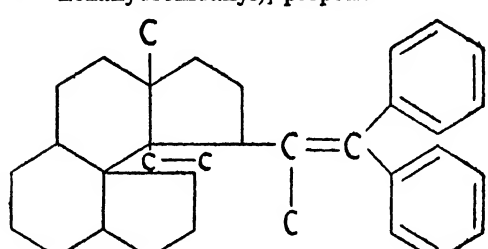
**1,2,3,4,5,6,7,8-Tetracyclohexano-9,10-dihydroanthracene**



M. P., °C
382–383[6]

## $C_{34}H_{44}$

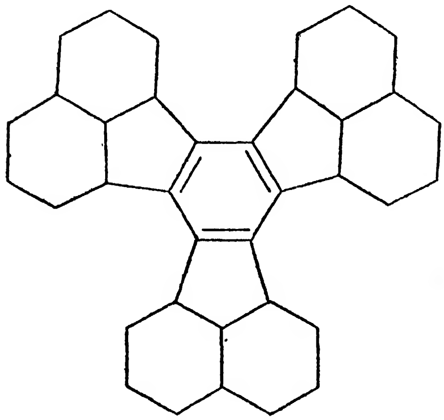
**1,1-Diphenyl-2-[3′-(hexahydroindano-[e-7″,7a″]-3a′-ethyl-7a′-methylhexahydroindanyl)]-propene-1**



M. P., °C
178[12]

## $C_{36}H_{48}$

**1,2,3,4,5,6-Tri-[2',1'-(2a',3',4',5',5a',6',7',8',8a',8b'-decahydro-acenaphtho)]-benzene**



M. P., °C
217–219[51]
215[49]

B. P., °C @ 760mm
360 0.2[1?]

(a) The structures given cholestane and derivatives vary. The above name and structure appear in reference 48.


*References on Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-24}$*

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2. Bachmann, W. E., J. Org. Chem. **1,** 347 **1936–37.**
3. Bachmann, W. E , J. Org. Chem. **3,** 434 **1938–39.**
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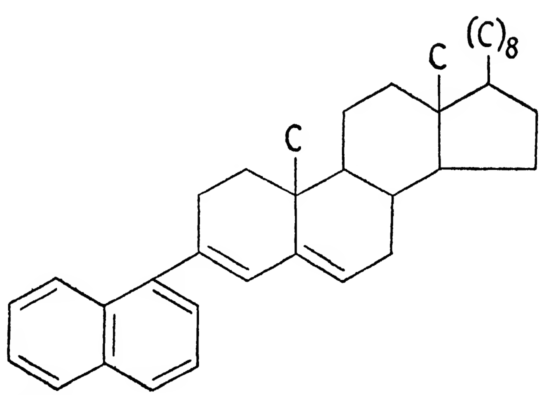
## $C_{37}H_{50}$

**3-$\alpha$-Naphthylcholestadiene** (a)




M. P., °C
131–133[48]

Additional Data
$[\alpha]_D^{29} = -49.7°$ [48]

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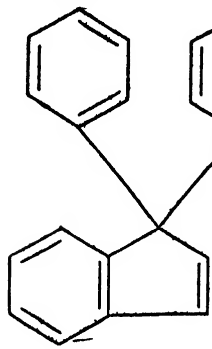
# X. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-26}$

1. Indene with Two Phenyl Substitutions
2. Binaphthyls, Their Alkyl Derivatives, and Two Naphthyl Substitutions on Alkanes
3. Anthracene and Phenanthrene with One Phenyl Substitution
4. Cholanthrene and Its Alkyl Derivatives
5. Other Benzocyclanoanthracenes, Benzocyclanophenanthrenes, and Their Alkyl Derivatives
6. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-26}$

## 1. INDENE WITH TWO PHENYL SUBSTITUTIONS, $C_nH_{2n-26}$

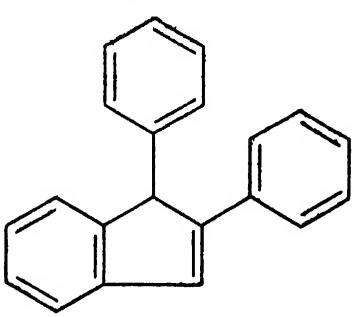
### $C_{21}H_{16}$

**1,1-Diphenylindene**



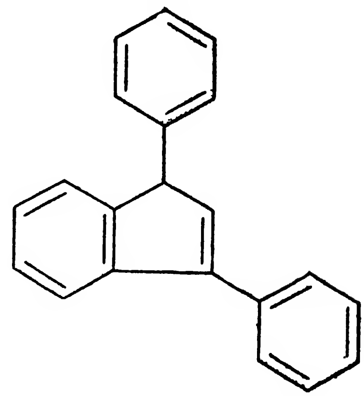
M. P., °C
91–92[13]
90–91[14]

**1,2-Diphenylindene**



M. P., °C
**177**
177–178[19, 20, 21]
177[25]
176–177[23, 24]
175[3]
174–175[1]

**1,3-Diphenylindene**

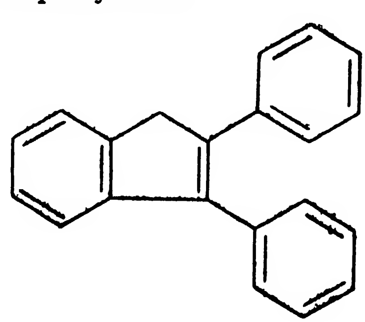


M. P., °C
84–85 (a)[12]
71–72[31]
68–69 (a)[12]

B. P., °C @ 760mm
230 15[31]

(a) These constants were determined on different crystalline forms.

**2,3-Diphenylindene**



M. P., °C
**109.5**
111[7]
110[2]

109–110[21]
108–109[20, 29]
108[25]
107–108[23, 24]

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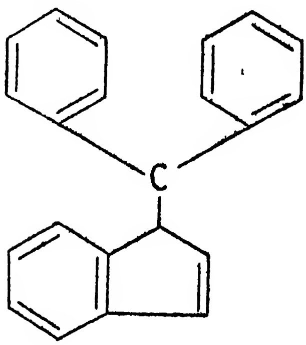
## $C_{22}H_{18}$

### 1-Benzhydrylindene



M. P., °C
163–164[6]
161[11]
160–161[10]

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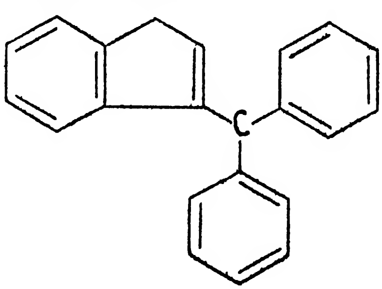
### 3-Benzhydrylindene



M. P., °C
115–116[10, 11]
114[26]
113–114[6, 28]

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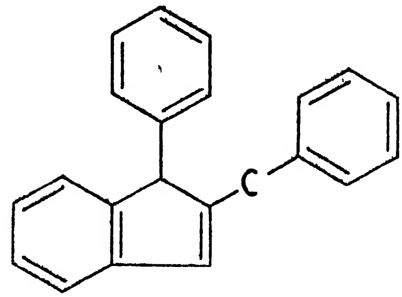
### 1-Phenyl-2-benzylindene



M. P., °C
101[24]
97–99[6]

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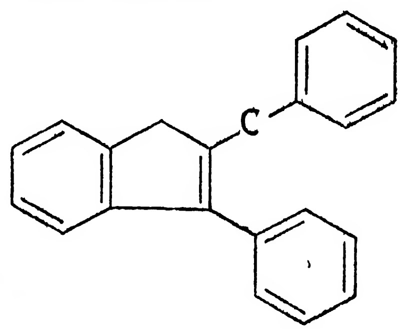
### 2-Benzyl-3-phenylindene



M. P., °C
101[5]
96-98[4, 8]
96–97.5[8]
92–93[22]

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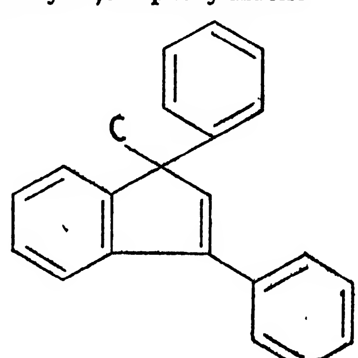
### 1-Methyl-1,3-diphenylindene



M. P., °C
59–60[16, 17]
B. P., °C @ 760mm
205–210 7[17]

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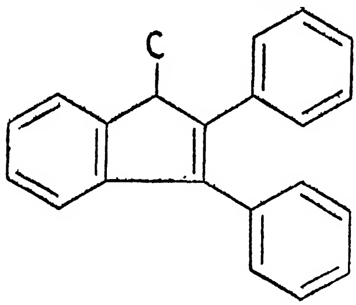
**1-Methyl-2,3-diphenylindene**



M. P., °C
106.5[17]

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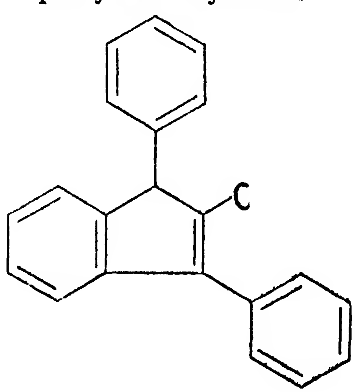
**1,3-Diphenyl-2-methylindene**



M. P., °C
108[15]

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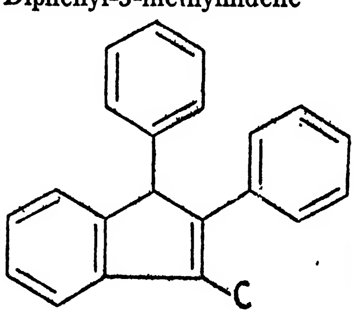
**1,2-Diphenyl-3-methylindene**



M. P., °C
91[17]

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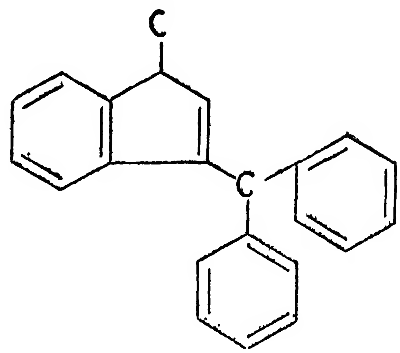
## $C_{23}H_{20}$

**1-Methyl-3-benzhydrylindene**



M. P., °C
162.5–163.5[30]

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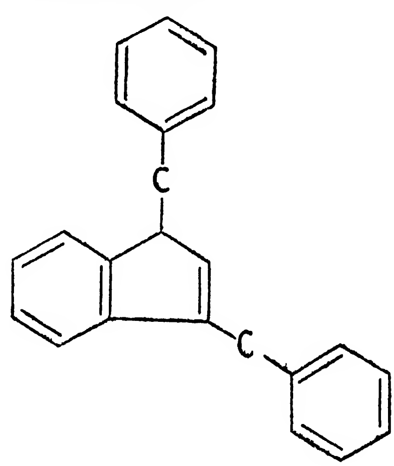
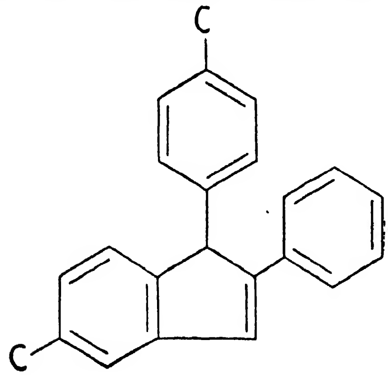
**1,3-Dibenzylindene**



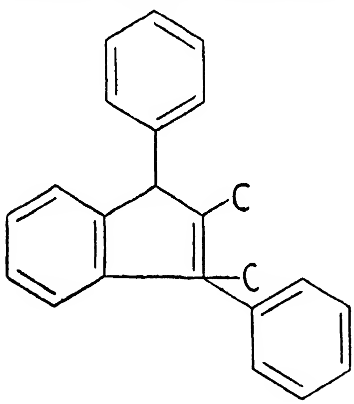
M. P., °C
62–63[27]

## 1-*p*-Tolyl-2-phenyl-5-methylindene



M. P., °C
145–146[18]

## 1,3-Diphenyl-2,3-dimethylindene



M. P., °C
68.5–69.5[9]

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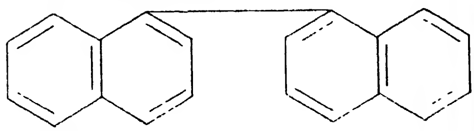
## 2. BINAPHTHYLS, THEIR ALKYL DERIVATIVES, AND TWO NAPHTHYL SUBSTITUTIONS ON ALKANES, $C_nH_{2n-26}$

### $C_{20}H_{14}$

**1,1′-Binaphthyl**



M. P., °C

**155.5**

160.5[22, 46]

157–158[18]

156[25, 37]

155[5, 27, 38]

154–155[36]

154 (a)

153–154[24]

153[9]

B. P., °C @ 760mm

240–244 12[37]

(a) The melting point 154 is found in references 2, 6, 16, 17, 20, 21, 26, 30, 32, 35, 41.

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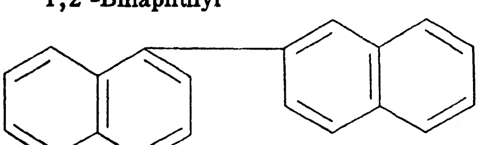
**1,2′-Binaphthyl**



M. P., °C

**76**

79–80[22, 42]

76[36]

75–76[44]

75[33, 34, 35]

74.5–75.0[14A]

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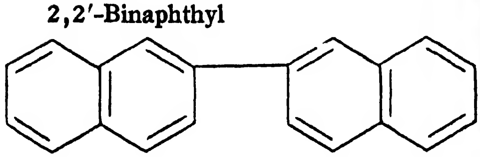
**2,2′-Binaphthyl**



M. P., °C

**187**

190[3, 28]

187–189[12]

188[43]

187–188[4]

187.8[7]

187.5[22]

187 (a)

186[23, 47]

184[25]

182–184[31]

181–182.5[29]

182[14, 15]

B. P., °C @ 760mm

452[7]

(a) The melting point 187 is found in references 1, 8, 10, 11, 13, 17, 19, 33, 34, 35, 36, 39, 40, 45.

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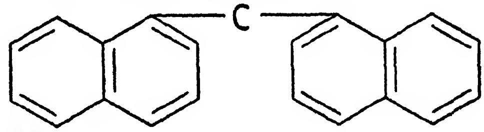
## $C_{21}H_{16}$

### Di-1,1′-naphthylmethane




M. P., °C
- **108**
- 109[1, 5, 6, 7, 15]
- 108–109[19]
- 106–107[20]

B. P., °C @ 760mm

| | |
|---|---|
| 245–250 | 4[1] |

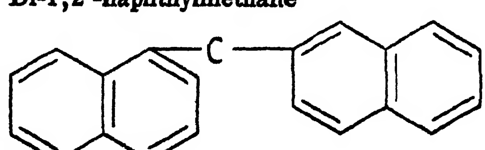
$D_4^{20}$

| | |
|---|---|
| 1.0224 | 52° [19] |

$n_D^{20}$

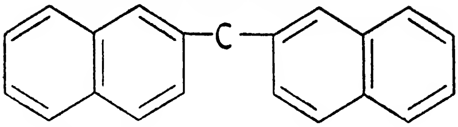
| | |
|---|---|
| 1.686 | 52° [19] |
| 1.677 | $n_{H\alpha}^{52}$ [19] |
| 1.712 | $n_{H\beta}^{52}$ [19] |

### Di-1,2′-naphthylmethane




M. P., °C
- 96[23]
- 95–96[5]

**Di-2,2′-naphthylmethane**



M. P., °C
93[5, 8]
92[24]

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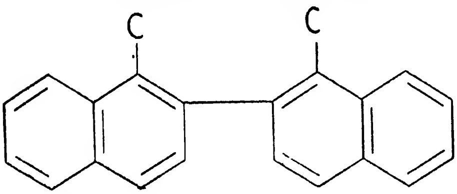
$C_{22}H_{18}$

**1,1′-Dimethyl-2,2′-binaphthyl**



M. P., °C
230[29]
227[10, 21]

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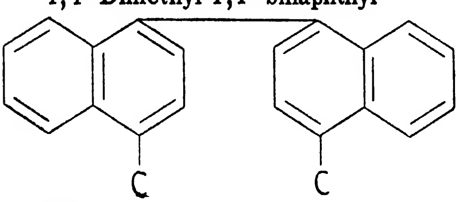
**4,4′-Dimethyl-1,1′-binaphthyl**



M. P., °C
147[10]

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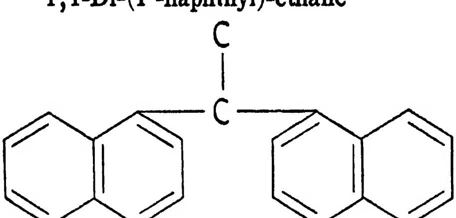
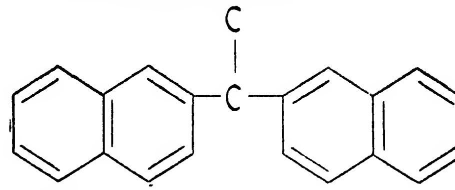
**1,1-Di-(1′-naphthyl)-ethane**



M. P., °C
136[9]

**1,1-Di-(2′-naphthyl)-ethane**



M. P., °C
182[12]

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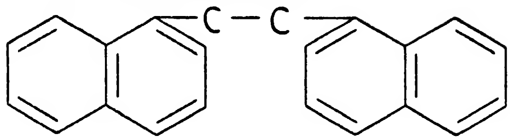
*This series continued on next poge*

**1,2-Di-(1′-naphthyl)-ethane**



M. P., °C

**161**

162–163[30]

161–162[22]

161–161.5[31]

160[3, 27, 33]

159–160[11]

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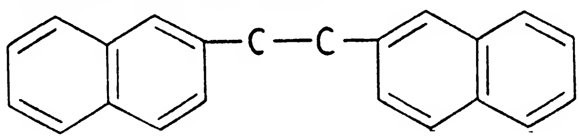
**1,2-Di-(2′-naphthyl)-ethane**



M. P., °C

182–183[30]

182[22]

181–182[32]

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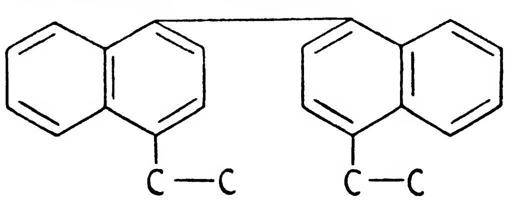
$C_{24}H_{22}$

**4,4′-Diethyl-1,1′-binaphthyl (a)**

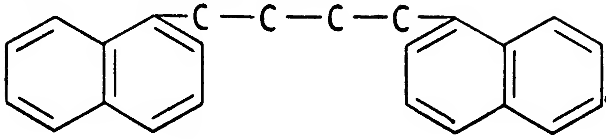


M. P., °C

76–77[18]

(a) The structure of this compound was not clearly defined in the literature.

**1,4-Di-(1′-naphthyl)-butane**



M. P., °C.
102[16]
101[2]

B. P., °C @ 760mm
240 3[16]

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**x,x-Di-[1′-(2′-methylnaphthyl)]-ethane (a)**

M. P., °C
177–178[17]

(a) The structure of this compound was not clearly defined in the literature.

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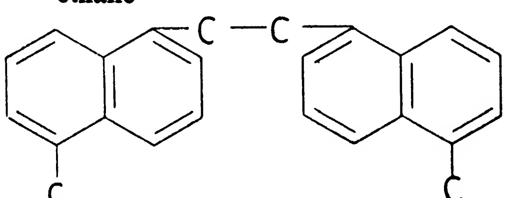
**1,2-Di-[1′-(5′-methylnaphthyl)]-ethane**



M. P., °C
115–117[26]

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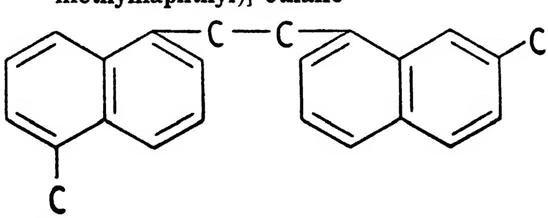
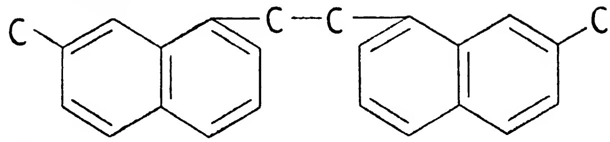
**1-[1′-(5′-Methylnaphthyl)]-2-[1″-7″-methylnaphthyl)]-ethane**



M. P., °C
74–75[25]

B. P., °C @ 760mm
192–193 0.1[25]

**1,2-Di-[1′-(7′-methylnaphthyl)]-ethane**



M. P., °C
122.5–123.5[28]

B. P., °C @ 760mm
220–225 0.3[28]

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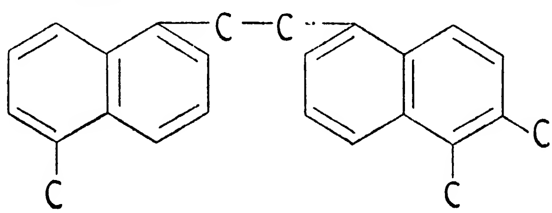
$C_{25}H_{24}$

**1-[1′-(5′-Methylnaphthyl)]-2-[1″-(5″,6″-dimethylnaphthyl)]-ethane**



M. P., °C
128–129[26]

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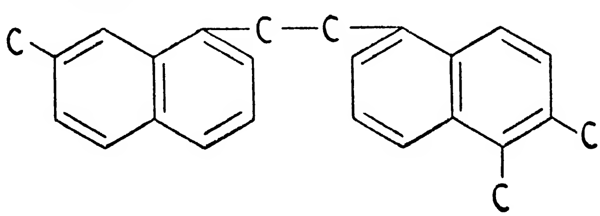
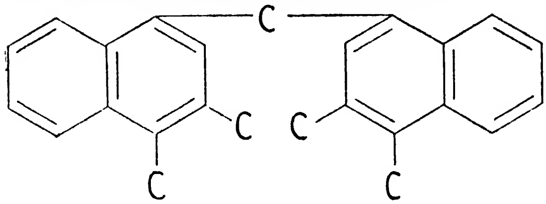
**1-[1′-(7′-Methylnaphthyl)]-2-[1″-(5″,6″-dimethylnaphthyl)]-ethane**



M. P., °C
108.5–109.5[28]

B. P., °C @ 760mm
225–230 0.2[28]

**Di-1-(3,4-dimethylnaphthyl)-methane**



M. P , °C
174–175[17]

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$C_{26}H_{26}$

**$x_6$-Hexamethyl-x,x′-binaphthyl** (a)

M. P., °C
183[18]

(a) The structure of this compound was not clearly defined in the literature.

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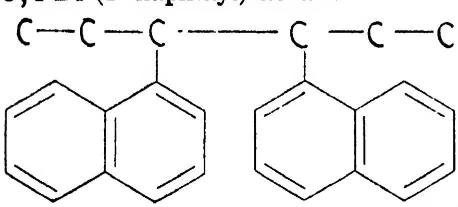
**3,4-Di-(1′-naphthyl)-hexane**



M. P., °C
155[4]

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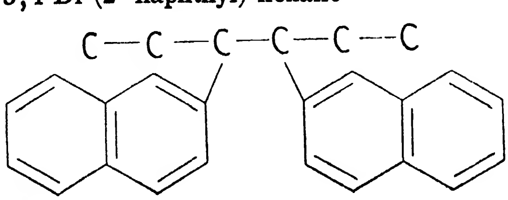
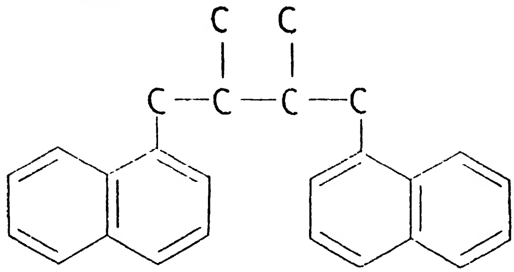
**3,4-Di-(2′-naphthyl)-hexane**



M. P., °C
198[4]

**1,4-Di-(1′-naphthyl)-2,3-dimethyl-butane**



M. P., °C
131–132[2]

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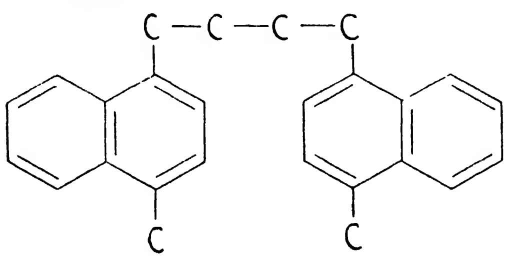
**1,4-Di-[1′-(4′-methylnaphthyl)]-butane**



M. P., °C
126–127[14]

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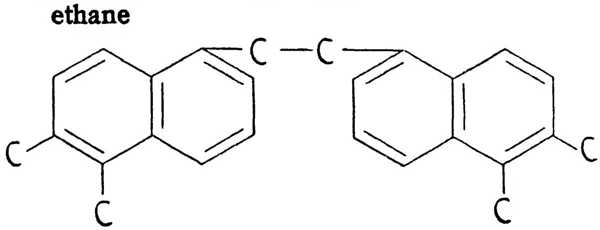
**1,2-Di-[1′-(5′,6′-dimethylnaphthyl)]-ethane**



M. P., °C
163–165[26]

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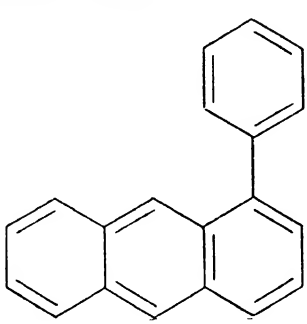
## 3. ANTHRACENE AND PHENANTHRENE WITH ONE PHENYL SUBSTITUTION, $C_nH_{2n-26}$

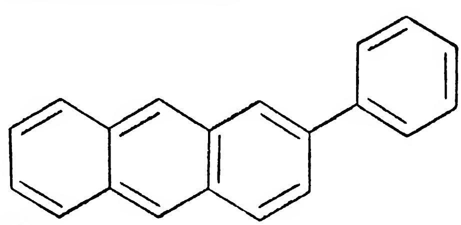
### $C_{20}H_{14}$

**1-Phenylanthracene**



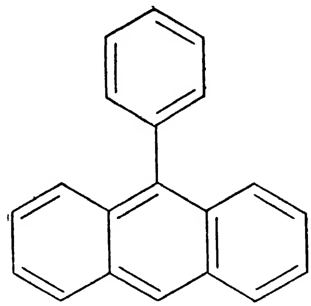
M. P., °C
123[44]
110–112[20, 22]

**2-Phenylanthracene**



M. P., °C
207–207.5[22]

**9-Phenylanthracene**



M. P., °C
**154.5**
155–157[4]
156[27, 36, 41]
155[26]
152–153[40, 42]
152.8[35]

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**x-Phenylanthracene** (a)

B. P., °C @ 760mm
417[29]

(a) The structure of this compound was not clearly defined in the literature.

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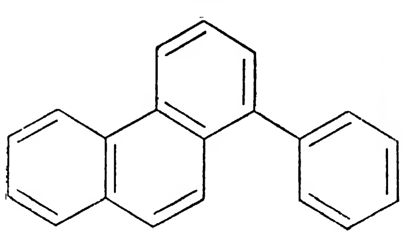
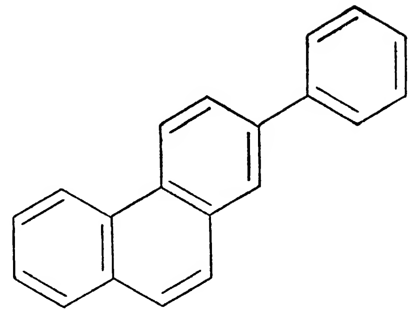
**1-Phenylphenanthrene**



M. P., °C
79–79.5[3]

**2-Phenylphenanthrene**



M. P., °C
196.6–197.2[37]

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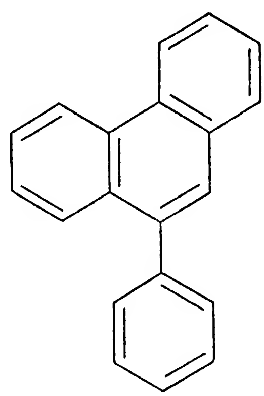
**9-Phenylphenanthrene**



M. P., °C
113[43]
110[13]
105–106[28, 32]
104–105[18]

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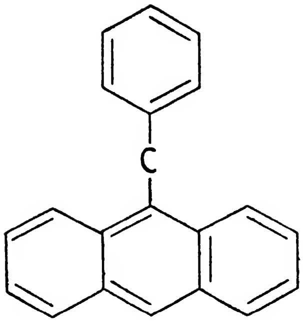
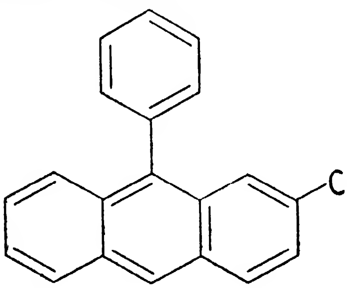
$C_{21}H_{16}$

**9-Benzylanthracene**



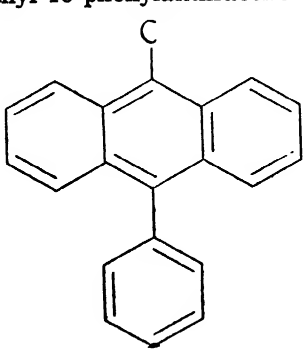
M. P., °C
133[14, 21]

**2-Methyl-9-phenylanthracene**



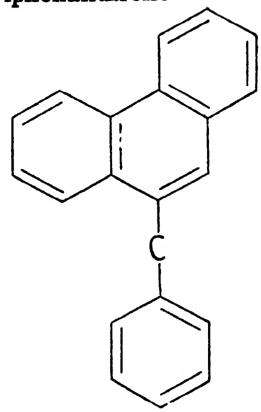
M. P., °C
119[31, 39]

**9-Methyl-10-phenylanthracene**



M. P., °C
116[38]
113.5–114.5[15]
112.5–113.5[19]
113[12]
112[11]

**9-Benzylphenanthrene**



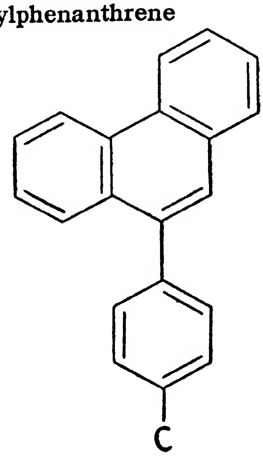
M. P., °C
155–156[30]
154[24]
153–154[1, 2]

**x-Benzylphenanthrene** (a)

M. P., °C
107–108[2]
105–106[2]
95–96[2]
91–92[45]
79–80[2]

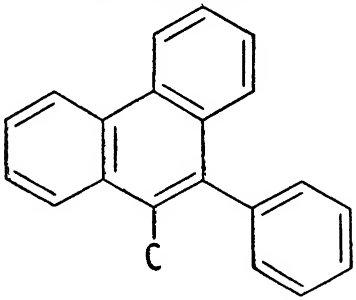
(a) The structures of these compounds were not clearly defined in the literature.

**9-*p*-Tolylphenanthrene**



M. P., °C
90–91[18]

**9-Methyl-10-phenylphenanthrene**



M. P., °C
99–100[17]

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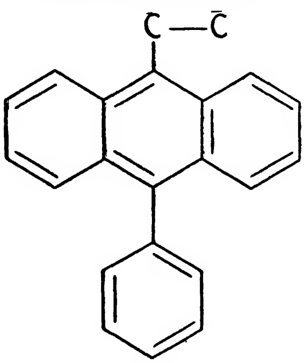
$C_{22}H_{18}$

**9-Ethyl-10-phenylanthracene**



M. P., °C
110[5]
107–108.5[19]

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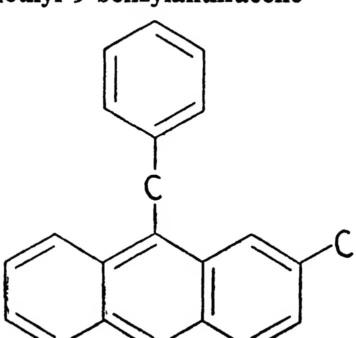
**2-Methyl-9-benzylanthracene**



M. P., °C
139[6]

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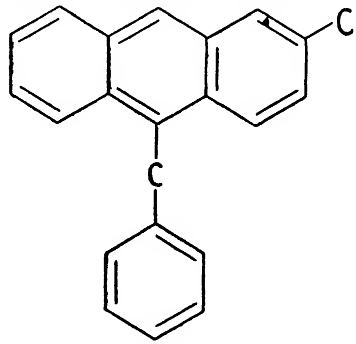
**2-Methyl-10-benzylanthracene**



M. P., °C
101[6]

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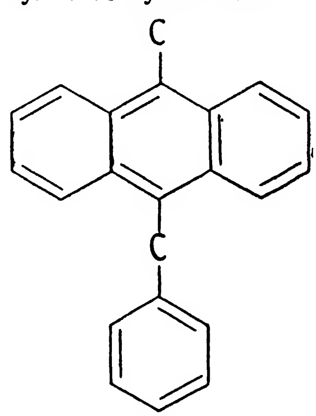
**9-Methyl-10-benzylanthracene**



M. P., °C
167.8–168.6[15]

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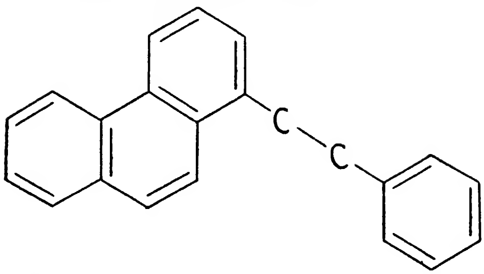
**x-Methyl-9-tolylanthracene** (a)
M. P., °C
191[34]

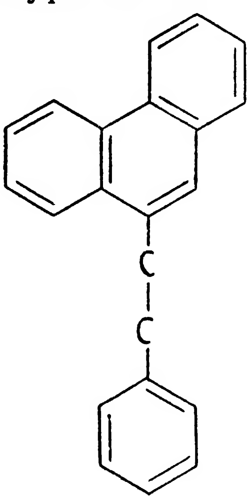
(a) The structure of this compound was not clearly defined in the literature.

1-Phenethylphenanthrene



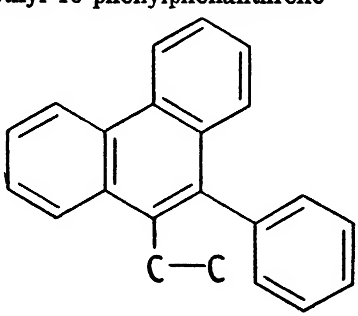
M. P., °C
86.5–89.5[25]

9-Phenethylphenanthrene



M. P., °C
81.5[13]

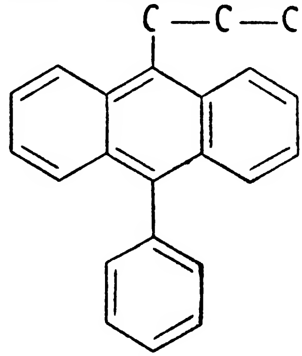
9-Ethyl-10-phenylphenanthrene



M. P., °C
161[17]

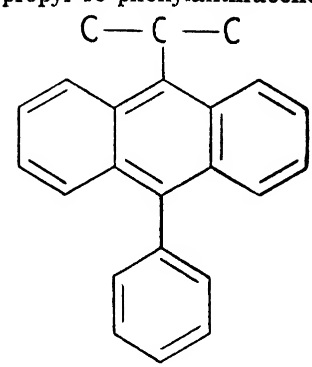
$C_{23}H_{20}$

9-*n*-Propyl-10-phenylanthracene



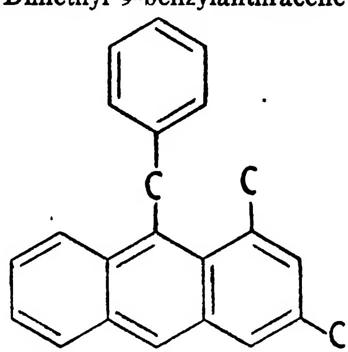
M. P., °C
115–116[5]

9-Isopropyl-10-phenylanthracene



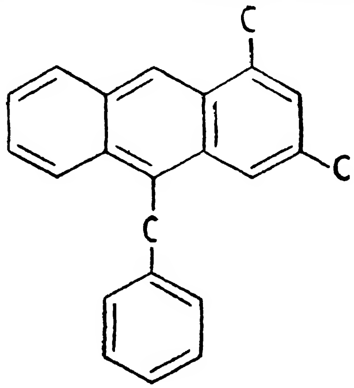
M. P., °C
166–167[5]

1,3-Dimethyl-9-benzylanthracene



M. P., °C
126[8]

**1,3-Dimethyl-10-benzylanthracene**



M. P., °C
149[8]

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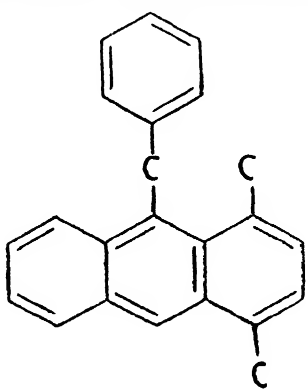
**1,4-Dimethyl-9-benzylanthracene**



M. P., °C
135[9]

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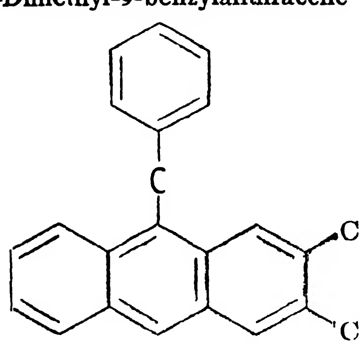
**2,3-Dimethyl-9-benzylanthracene**



M. P., °C
149[10]

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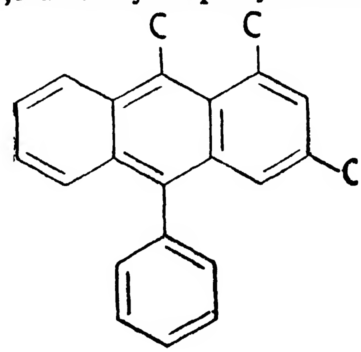
**1,3,9-Trimethyl-10-phenylanthracene**



M. P., °C
165[8]

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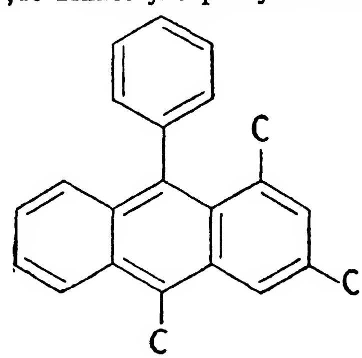
**1,3,10-Trimethyl-9-phenylanthracene**



M. P., °C
121[8]

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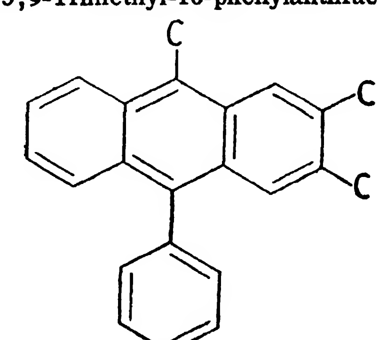
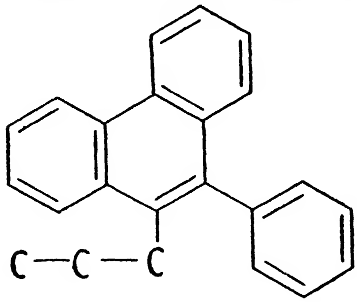
**2,3,9-Trimethyl-10-phenylanthracene**



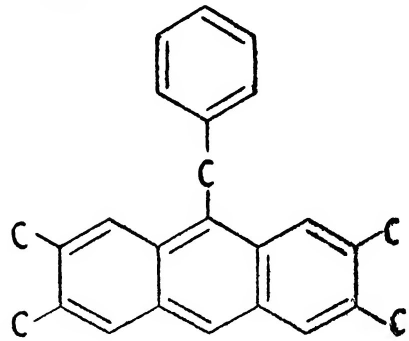
M. P., °C
119[10]

**9-*n*-Propyl-10-phenylphenanthrene**



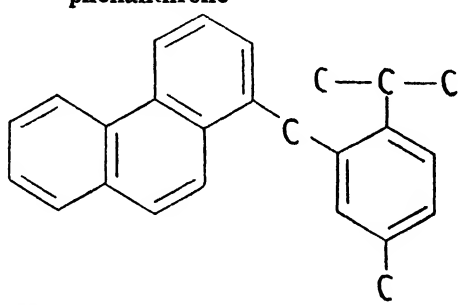
M. P., °C
148.5–149.5[16]

**2,3,6,7-Tetramethyl-9-benzylanthracene**



M. P., °C
235[7]

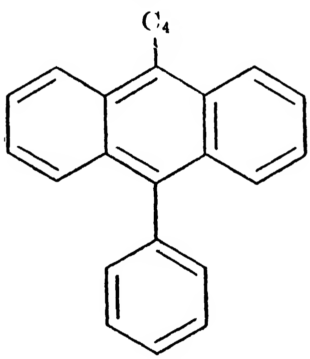
**1-(2′-Isopropyl-5′-methylbenzyl)-phenanthrene**



M. P., °C
115–116[23]

$C_{24}H_{22}$

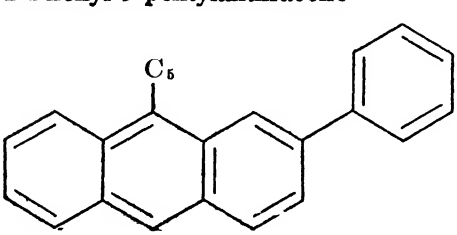
**9-Butyl-10-phenylanthracene**



M. P., °C
156[5]

$C_{25}H_{24}$

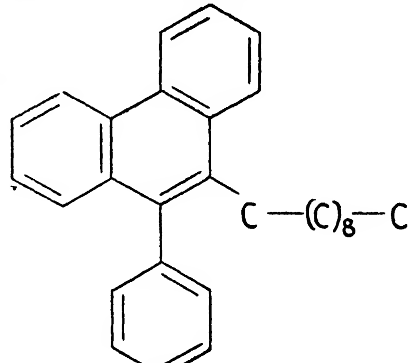
**2-Phenyl-9-pentylanthracene**



M. P., °C
203–204[5]

$C_{30}H_{34}$

**9-Phenyl-10-*n*-decylphenanthrene**



M. P., °C
99–100[16]

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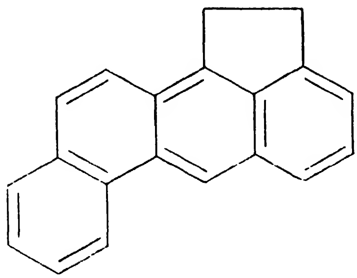
## 4. CHOLANTHRENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-26}$

$C_{20}H_{14}$

**Cholanthrene**



M. P., °C

**172**

173.0–173.5[25]

173–173.5[20]

170–171[11]

170.1–170.6[12]

168.5–170[2, 10]

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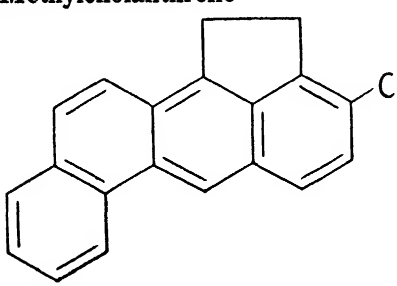
$C_{21}H_{16}$

**3-Methylcholanthrene**



M. P., °C

**178.9**

180.3–180.6[1]

179.5–180[15]

178.5–179.5[21]

178.5–179[16, 18, 25]

178–179[24]

177–178[16]

176.5–177.5[9]

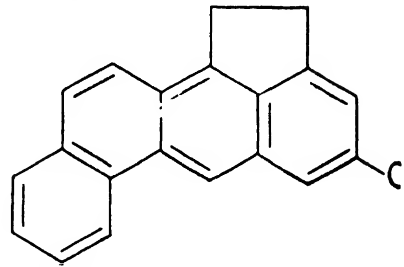
175.3–177.1[12]

176–177[17]

175–177[4]

175.5[14]

**4-Methylcholanthrene**



M. P., °C

154.5–155[3]

153–154[13]

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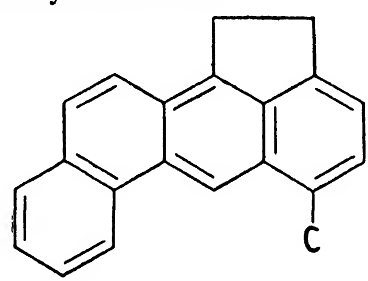
**5-Methylcholanthrene**



M. P., °C

160–161.5 (a)[3]

(a) This compound remelts at 164–165.

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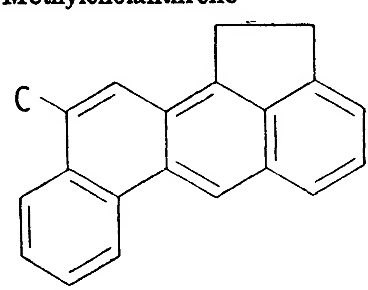
**11-Methylcholanthrene**



M. P., °C

204.2–205.2[13]

**x-Methylcholanthrene** (a)

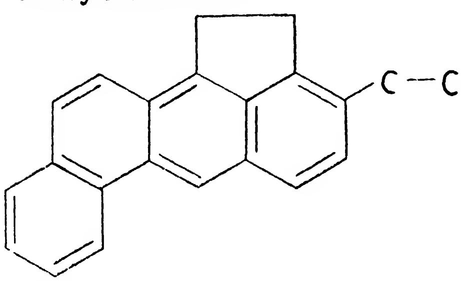
$D_4^{20}$

1.277[23]

(a) The structure of this compound was not clearly defined in the literature.

$C_{22}H_{18}$

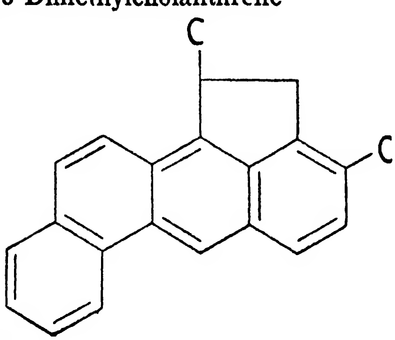
**3-Ethylcholanthrene**



M. P., °C

179.5–180[5, 7]

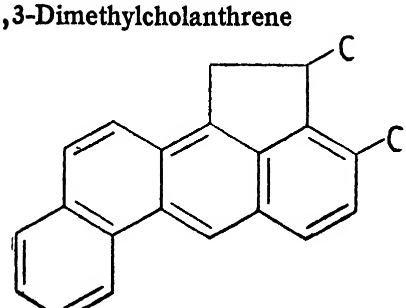
**1,3-Dimethylcholanthrene**



M. P., °C

179–180[6]

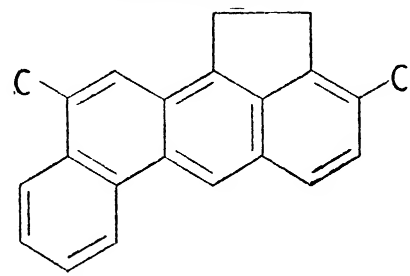
**2,3-Dimethylcholanthrene**



M. P., °C

169–170[19, 26]

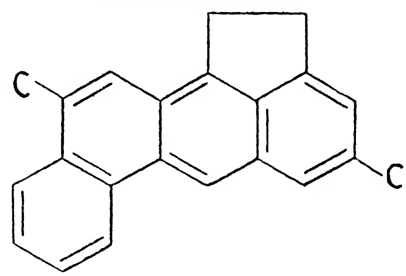
**3,11-Dimethylcholanthrene**



M. P., °C

175.8–176.5[13]

**4,11-Dimethylcholanthrene**

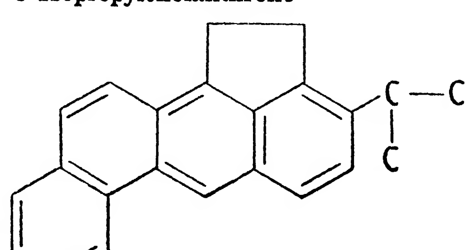


M. P., °C

161.7–162.4[13]

$C_{23}H_{20}$

**3-Isopropylcholanthrene**

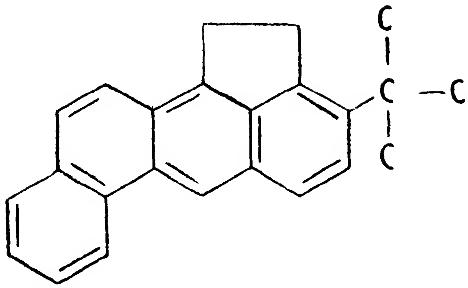


M. P., °C

188–189[8]

## $C_{24}H_{22}$

**3-*tert*-Butylcholanthrene**



M. P., °C

204–205[22]

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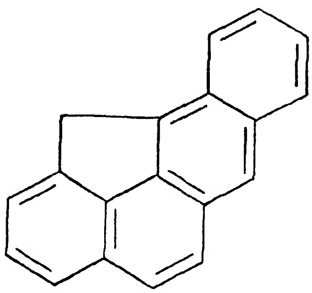
## 5. OTHER BENZOCYCLANOANTHRACENES, BENZOCYCLANOPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-26}$

### $C_{19}H_{12}$

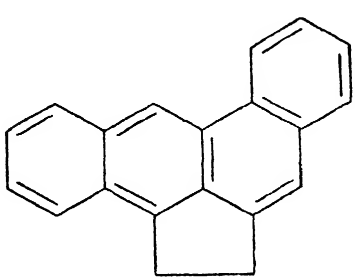
**Benzo-[b]-cyclopentano-[def]-phenanthrene**



M. P., °C
122.7–123.1[6]
122.5–123[7]
120–121[8]

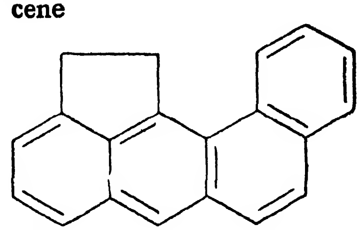
### $C_{20}H_{14}$

**Benzo-[a]-cyclopentano-[de]-anthracene**



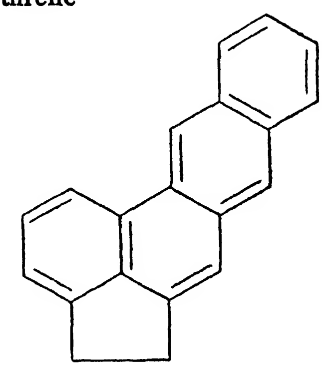
M. P., °C
138.5–140[12]
137–138[18]
133–134[17]
130[4]

**Benzo-[a]-cyclopentano-[kl]-anthracene**



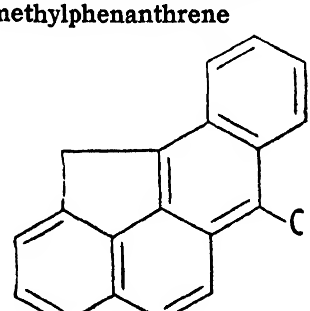
M. P., °C
176.5–177 [10, 18]

**Benzo-[b]-cyclopentano-[jk]-phenanthrene**



M. P., °C
233.1–234.3[5]
192.5–193.5[13]
192[1]

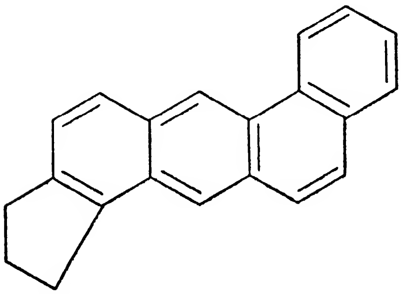
**Benzo-[b]-cyclopentano-[def]-1-methylphenanthrene**




M. P., °C
181–181.4[7]

$C_{21}H_{16}$

**1,2-Benzo-5,6-cyclopentanoanthracene**



M. P., °C
199–200[2, 3]

$D_4^{20}$
1.255 18° [14]

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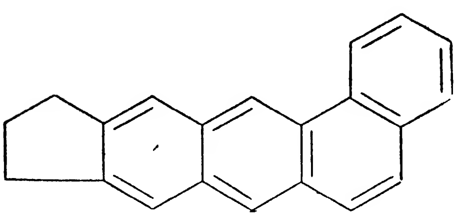
**1,2-Benzo-6,7-cyclopentanoanthracene**



M. P., °C
164–165[3]

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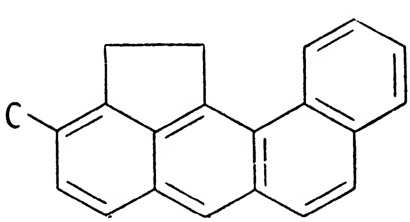
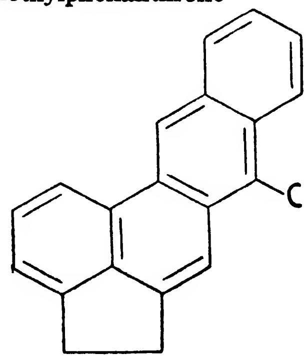
**Benzo-[a]-cyclopentano-[kl]-7-methylanthracene**



M. P., °C
187.5[9, 18]

**Benzo-[b]-cyclopentano-[jk]-1-methylphenanthrene**



M. P., °C
181.7–182.5[16]

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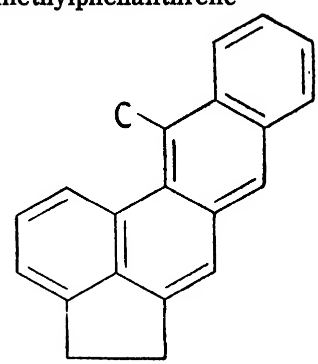
**Benzo-[b]-cyclopentano-[jk]-4-methylphenanthrene**



M. P., °C
133–134[15]

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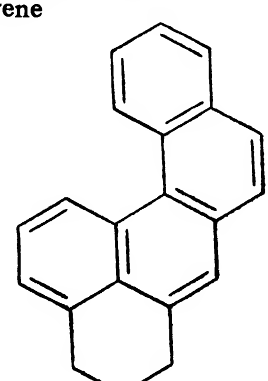
**Benzo-[c]-cyclohexano-[jk]-phenanthrene**



M. P., °C
138–138.5[11]

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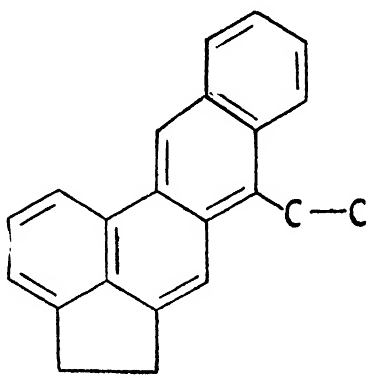
$C_{22}H_{18}$

Benzo-[b]-cyclopentano-[jk]-1-ethyl-phenanthrene



M. P., °C
174.5–175[16]

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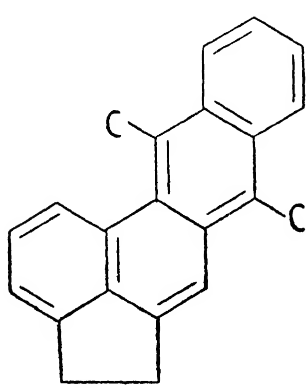
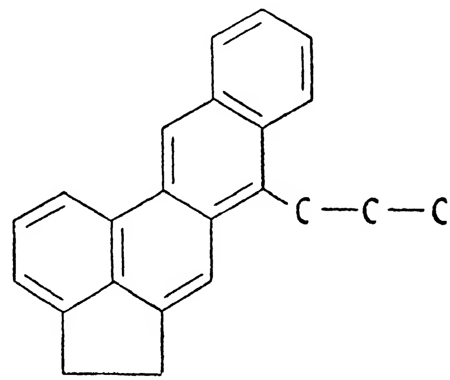
Benzo-[b]-cyclopentano-[jk]-1,4-dimethylphenanthrene



M. P., °C
164–164.5[15]

$C_{23}H_{20}$

Benzo-[b]-cyclopentano-[jk]-1-*n*-propylphenanthrene



M. P., °C
165.5–166.5[16]

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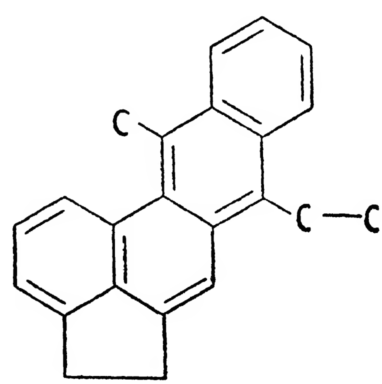
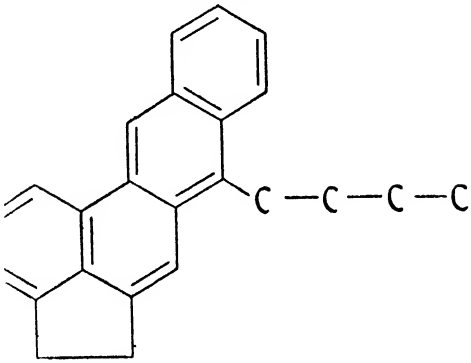
Benzo-[b]-cyclopentano-[jk]-1-ethyl-4-methylphenanthrene



M. P., °C
157.5–158.5[15]

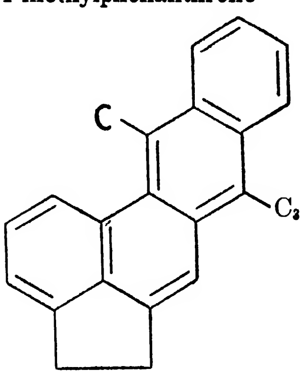
## $C_{24}H_{22}$

### Benzo-[b]-cyclopentano-[jk]-1-*n*-butylphenanthrene



M. P., °C
128–129[16]

### Benzo-[b]-cyclopentano-[jk]-1-propyl-4-methylphenanthrene



M. P., °C
119.5–120.5[15]

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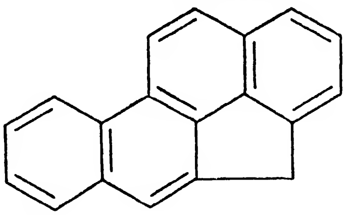
## 6. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-26}$

### $C_{19}H_{12}$

**Cyclopentano-[def]-chrysene**



M. P., °C
172.4–172.9[22]
172–172.5[22]
171.5–172.3[22]

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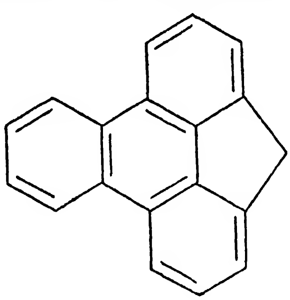
**Cyclopentano-[def]-triphenylene**



M. P., °C
115–116[37]

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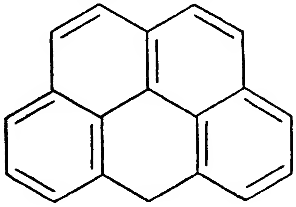
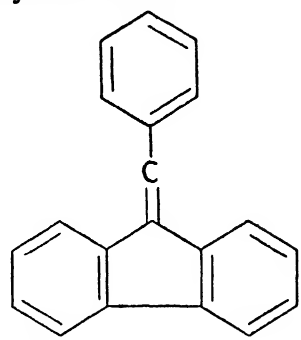
**Benzo-[cd]-5-hydropyrene**



M. P., °C
135[49]

### $C_{20}H_{14}$

**9-Benzylidenefluorene**



M. P., °C
153–154 (a)[42]
76 (b)

(a) This constant was determined on an isomeric form of the compound.
(b) The melting point 76 is found in references 32, 34, 38, 41, 46, 47, 48.

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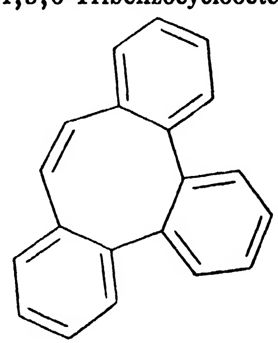
**1,2,3,4,5,6-Tribenzocyclooctene-7**



M. P., °C
138.5–139[44]

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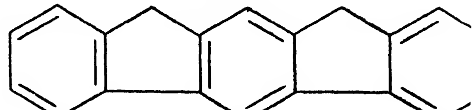
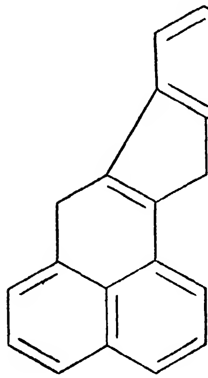
**2,3-(2′,3′-Indo)-fluorene**
(Ellagene)



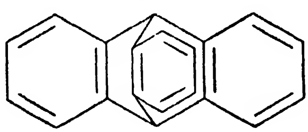
M. P., °C
197[38]

**2,3-(3′,2′-Indo)-phenalene**



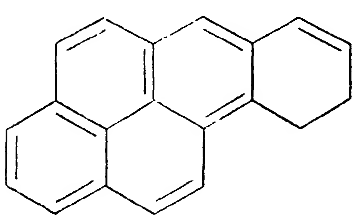
M. P., °C
185[11]

**9,10-Endo-o-phenylene-9,10-dihydroanthracene**
(Tryptycene)



M. P., °C
254.8–255.2[5]

**2,3-(Cyclohexen-3′-o)-pyrene** (a)

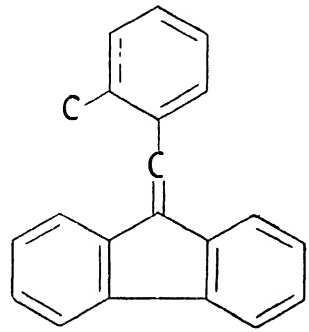


M. P., °C
149.5–150.0[1]
148–149[31]

(a) Reference 31 gives evidence that this compound may possibly be cyclohexano-[def]-chrysene.

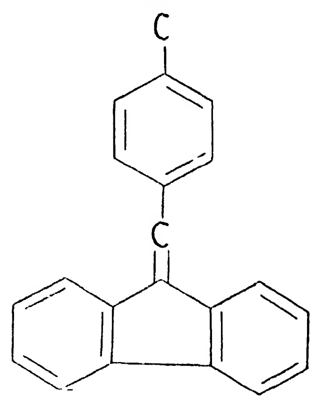
## $C_{21}H_{16}$

**9-(2′-Methylbenzylidene)-fluorene**



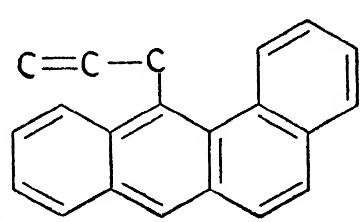
M. P., °C
109.5[15]

**9-(4′-Methylbenzylidene)-fluorene**



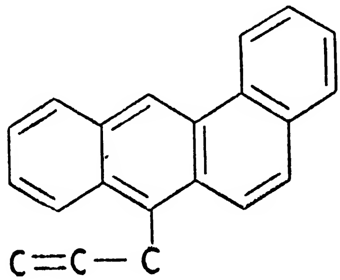
M. P., °C
97.5[15]

**1,2-Benzo-9-(propen-2′-yl)-anthracene**



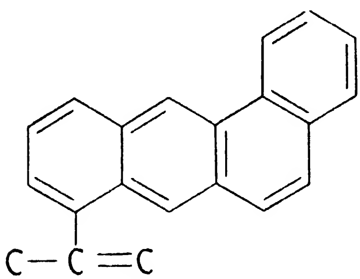
M. P., °C
115–116[26]

**1,2-Benzo-10-(propen-2′-yl)-anthracene**



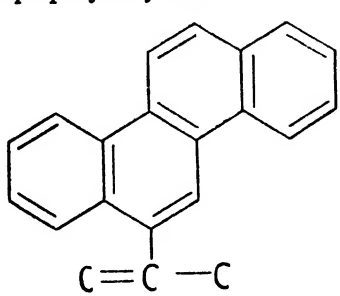
M. P., °C
125.5–126.5[25]

**1,2-Benzo-5-isopropenylanthracene**



M. P., °C
137–139[14]

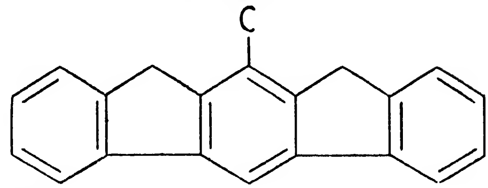
**6-Isopropenylchrysene**



M. P., °C
161[7]

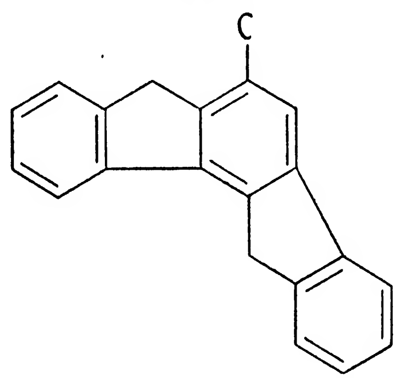
B. P., °C @ 760mm
220 [7]

**1-Methyl-2,3-(2′,3′-indo)-fluorene**
(Isophthalacene)



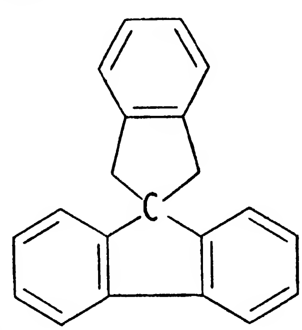
M. P., °C
222[20]

**1-Methyl-3,4-(3′,2′-indo)-fluorene**
(Phthalacene)



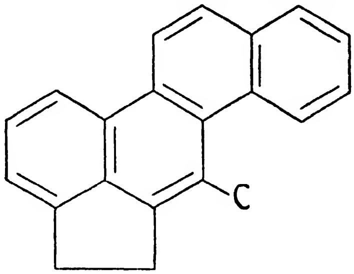
M. P., °C
173[30]

**Spiro[3,4-benzocyclopentane-1,9′-fluorene]**



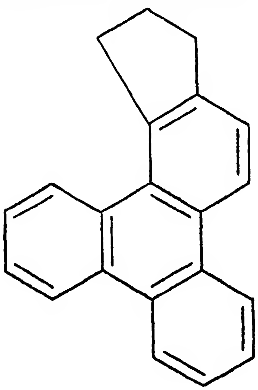
M. P., °C
220[21]

**Cyclopentano-[hi]-5-methylchrysene**



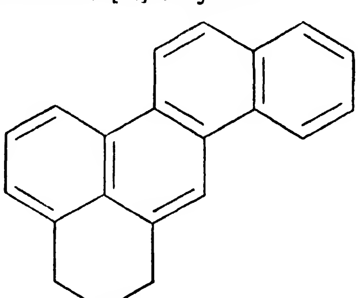
M. P., °C
169–169.5[2]

**1,2-Cyclopentanotriphenylene**



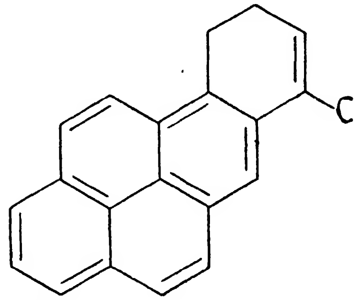
M. P., °C
171–172.5[6]
115–116[52]

**Cyclohexano-[hi]-chrysene**



M. P., °C
116.5–117[29, 43]

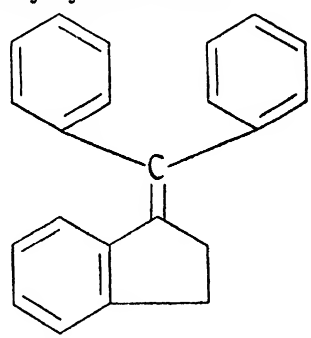
**1,2-(6′-Methylcyclohexen-5′-o)-pyrene**



M. P., °C
162–163[27]
155–156[23]

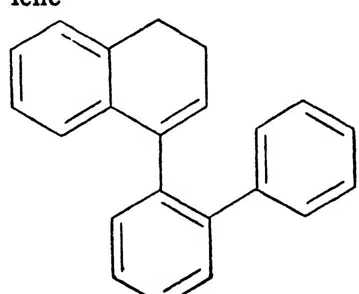
## $C_{22}H_{18}$

**1-Benzhydrylideneindane**



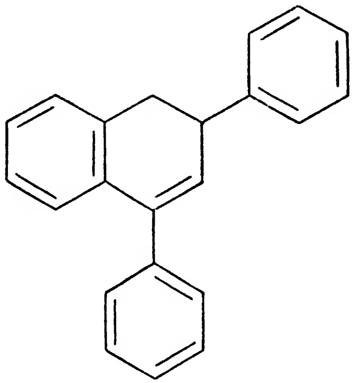
M. P., °C
92[16]

**4-o-Biphenylyl-1,2-dihydronaphthalene**



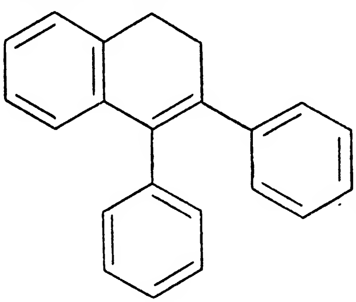
M. P., °C
75.5–76.5[9]

**2,4-Diphenyl-1,2-dihydronaphthalene**



M. P., °C
136[12]

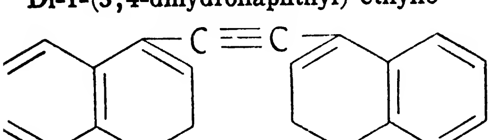
**3,4-Diphenyl-1,2-dihydronaphthalene**



M. P., °C
94–95[8]
76.5–77[12]
76[13]

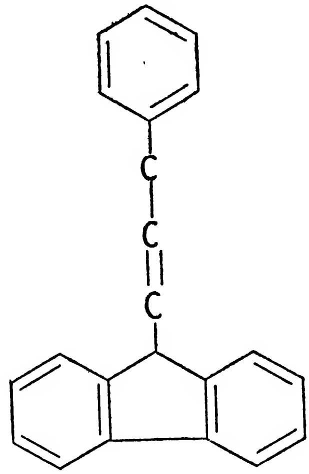
B. P., °C @ 760mm
210–215 0.5[8]

**Di-1-(3,4-dihydronaphthyl)-ethyne**



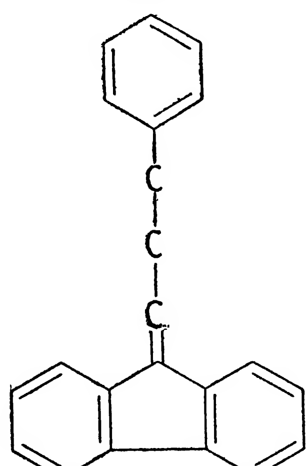
M. P., °C
124[17]
120–121[40]

**1-(9′-Fluoryl)-3-phenylpropene-1**



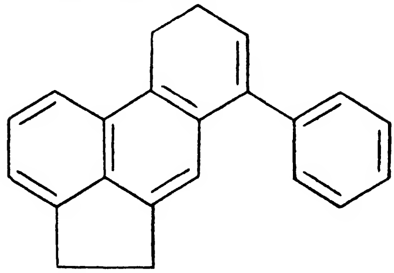
M. P., °C
88[33, 47]

**1-Phenyl-3-(9′-fluorylidene)-propane**



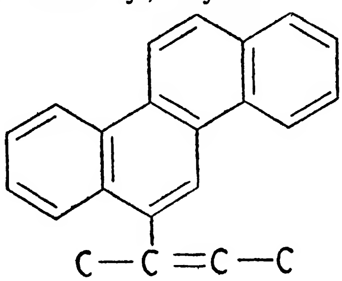
M. P., °C
81–82[47]
81[33]

**Cyclopentano-[jk]-1-phenyl-3,4-dihydrophenanthrene**



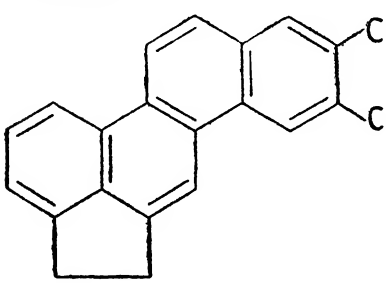
M. P., °C
144[28]

**6-(2′-Buten-2′-yl)-chrysene**



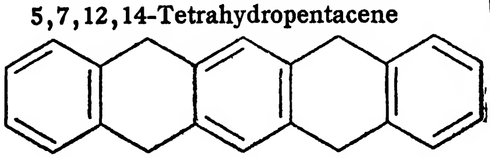
M. P., °C
159–160[7]

**Cyclopentano-[hi]-2,3-dimethylchrysene**



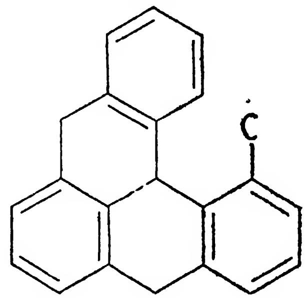
M. P., °C
222.6–223.1[24]

**5,7,12,14-Tetrahydropentacene**



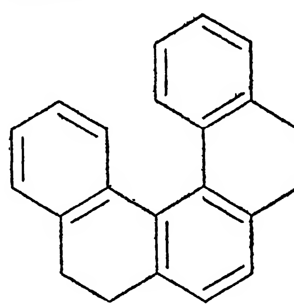
M. P., °C
244–245[30]
240–241[36]

**2,3-Benzo-4,5-(3′-methylbenzo)-3a,6-dihydrophenalene**



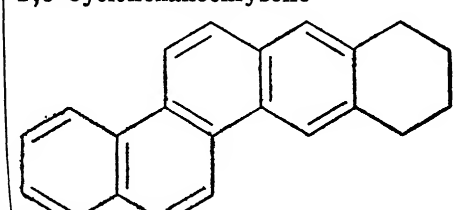
M. P., °C
182[51]

**3,4,5,6-Dibenzo-1,2,7,8-tetrahydrophenanthrene**



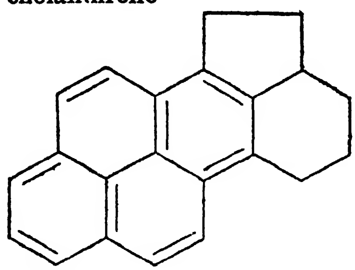
M. P., °C
142[50]

**2,3-Cyclohexanochrysene**



M. P., °C
217–218[15]

**Benzo-[hij]-2a,3,4,5-tetrahydro-cholanthrene**



M. P., °C
227.5–228.5[35]

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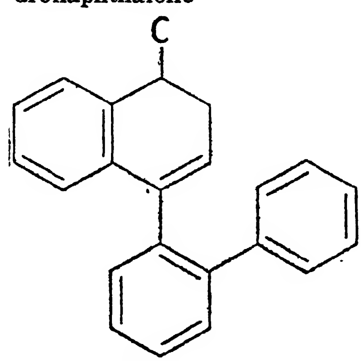
$C_{23}H_{20}$

**1-Methyl-4-o-biphenylyl-1,2-dihydronaphthalene**



B. P., °C @ 760mm
215–218 6–7[10]

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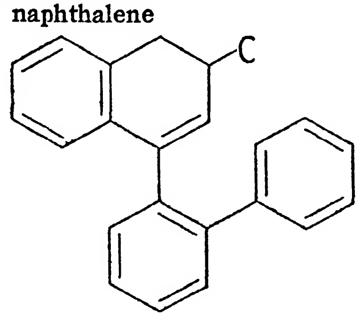
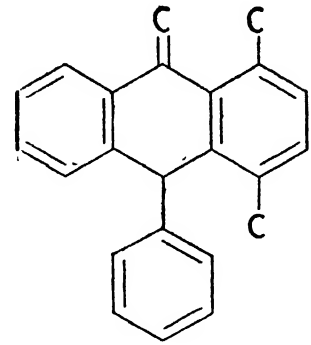
**2-Methyl-4-o-biphenylyl-1,2-dihydronaphthalene**



M. P., °C
77–78[10]

B. P., °C @ 760mm
218–220 8–9[10]

**1,4-Dimethyl-9-methylene-10-phenyl-9,10-dihydroanthracene**



M. P., °C
129[4]

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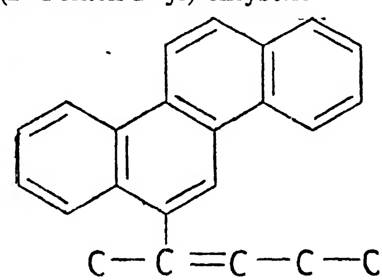
**6-(2′-Penten-2′-yl)-chrysene**



M. P., °C
102[7]

B. P., °C @ 760mm
210–215 0.1[7]

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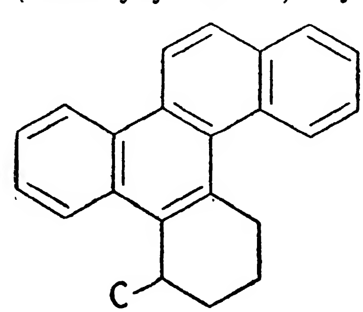
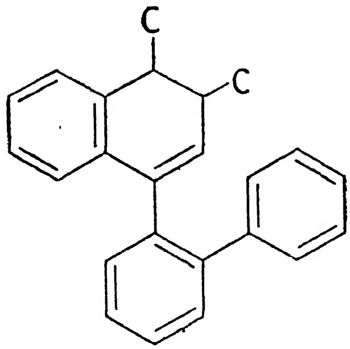
**5,6-(6′-Methylcyclohexano)-chrysene**



M. P., °C
139[7]

## $C_{24}H_{22}$

### 1,2-Dimethyl-4-*o*-biphenylyl-1,2-dihydronaphthalene



M. P., °C
78-79.5[10]

B. P., °C @ 760mm
217-218 8[10]

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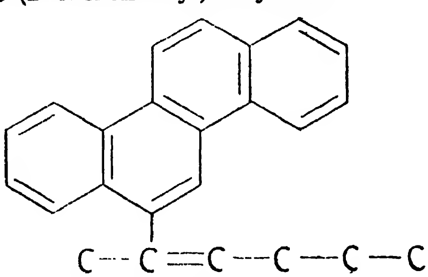
### 6-(2′-Hexen-2′-yl)-chrysene



B. P., °C @ 760mm
230-235 0.1[7]

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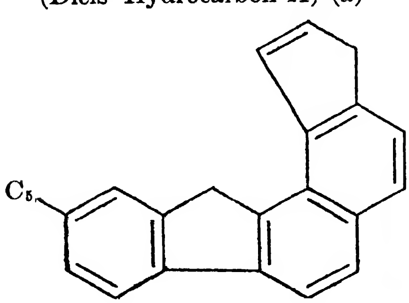
## $C_{25}H_{24}$

### 1,2-(4′,5′-Indo)-7-pentylfluorene (Diels' Hydrocarbon II) (a)



M. P., °C
220[18]
219[19]

(a) Although the above structure was assigned by Diels, it is not generally accepted as definite.

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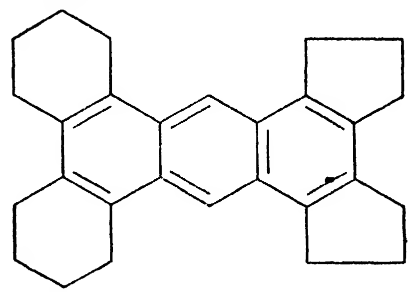
## $C_{28}H_{30}$

### 1,2,3,4-Dicyclopentano-5,6,7,8-dicyclohexanoanthracene



M. P., °C
342-344[3]

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*References on Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-26}$*


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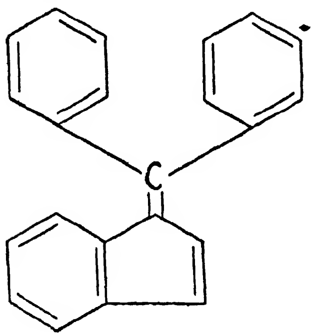
# XI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-28}$

1. Indene Derivatives of Empirical Formula $C_nH_{2n-28}$
2. Naphthalene with Two Phenyl or One Biphenylyl Substitutions
3. Benzopyrenes and Their Alkyl Derivatives
4. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-28}$

## 1. INDENE DERIVATIVES OF EMPIRICAL FORMULA $C_nH_{2n-28}$

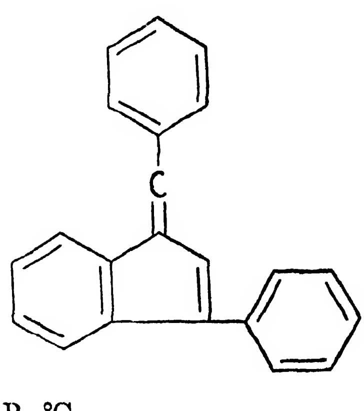
### $C_{22}H_{16}$

**1-Benzhydrylideneindene**



M. P., °C
114.5[7]
111–112[2, 4]

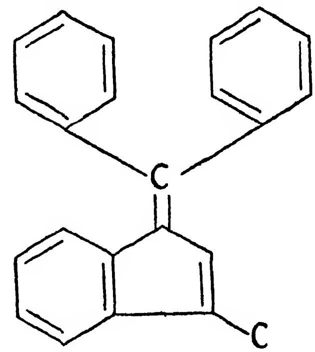
**1-Benzylidene-3-phenylindene**



M. P., °C
77.5[5]

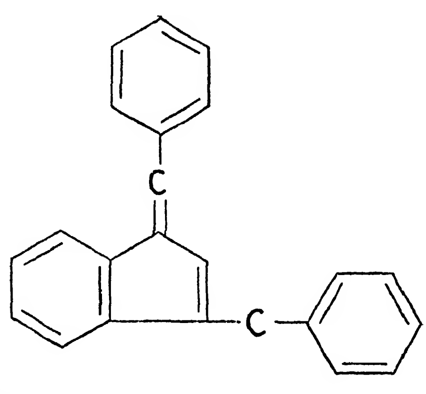
### $C_{23}H_{18}$

**1-Benzhydrylidene-3-methylindene**



M. P., °C
120–121[9]

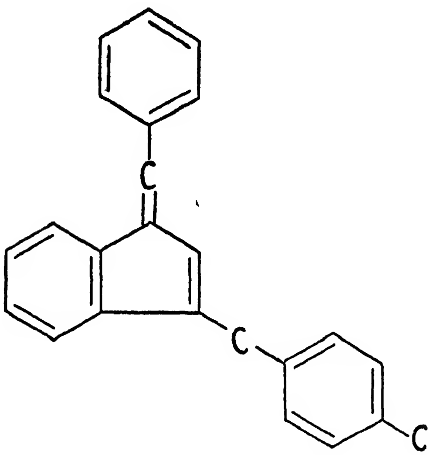
**1-Benzylidene-3-benzylindene**



M. P., °C
137–138[3]
137.5[8]
137–137.5[6]

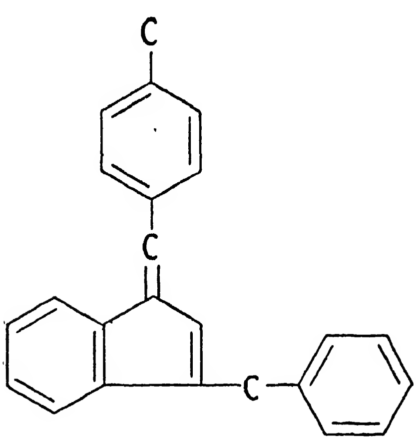
## $C_{24}H_{20}$

**1-Benzylidene-3-(4′-methylbenzyl)-indene**



M. P., °C
106–107[1]

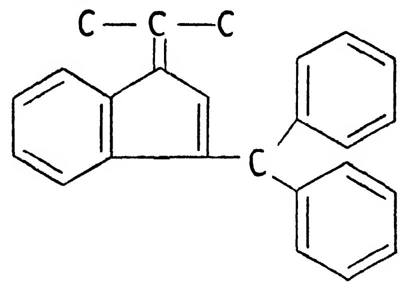
**1-(4′-Methylbenzylidene)-3-benzylindene**



M. P., °C
98–100[1]
94[8]

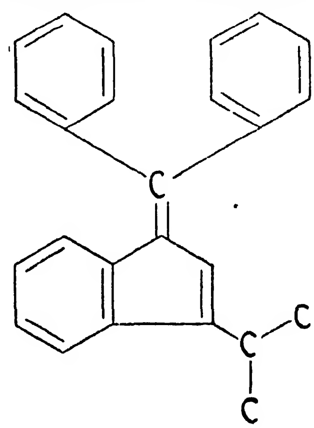
## $C_{25}H_{22}$

**1-Isopropylidene-3-benzyhydrylindene**



M. P., °C
174–175[9]

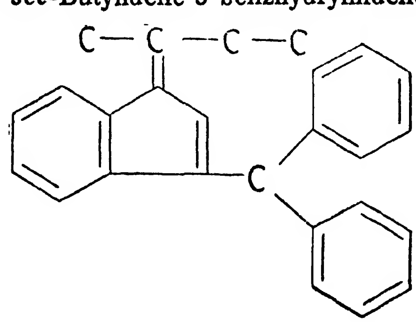
**1-Benzhydrylidene-3-isopropylindene**



M. P., °C
127–128[9]

## $C_{26}H_{24}$

**1-*sec*-Butylidene-3-benzhydrylindene**



M. P., °C
149.5–151[9]

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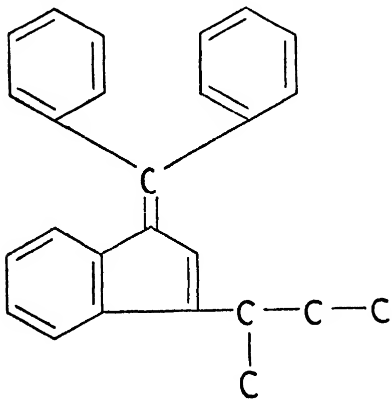
### 1-Benzhydrylidene-3-*sec*-butylindene



M. P., °C
91–92[9]

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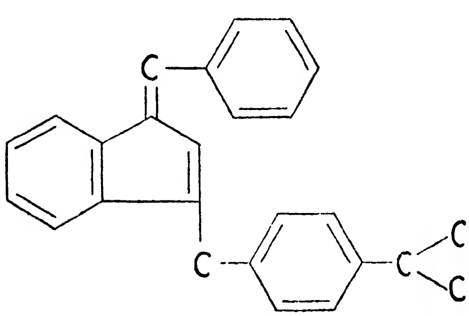
### 1-Benzylidene-3-(4′-isopropylbenzyl)-indene



M. P., °C
105–107[1]

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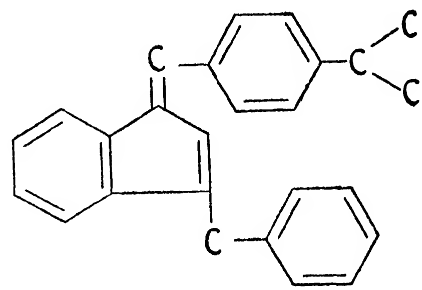
### 1-(4′-Isopropylbenzylidene)-3-benzylindene



M. P., °C
93–94[1]

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*References on Indene Derivatives of Empirical Formula $C_nH_{2n-28}$*

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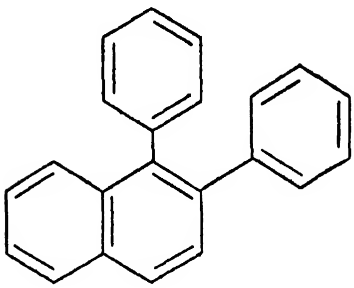
## 2. NAPHTHALENE WITH TWO PHENYL OR ONE BIPHENYLYL SUBSTITUTIONS, $C_nH_{2n-28}$

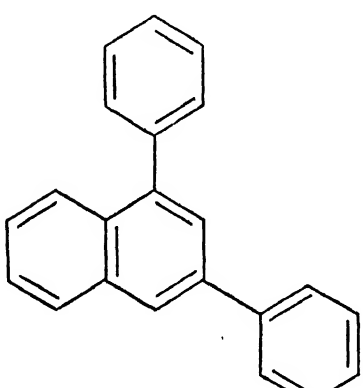
$C_{22}H_{16}$

**1,2-Diphenylnaphthalene**



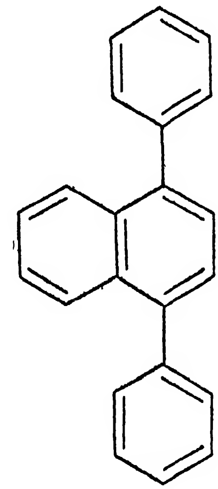
M. P., °C
114[5]
109.5–110[11]

**1,3-Diphenylnaphthalene**



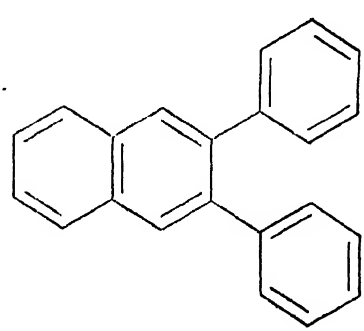
M. P., °C
70–71[11]

**1,4-Diphenylnaphthalene**



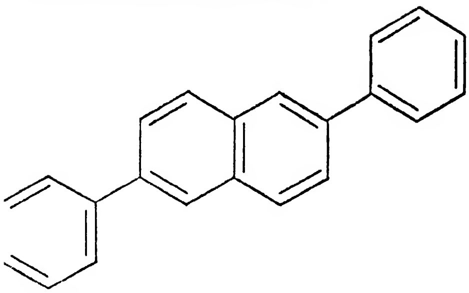
M. P., °C
135–137[36]
135–136[13, 14]
134–136[1]
133[31]
132–133[30]

**2,3-Diphenylnaphthalene**



M. P., °C
86–87[11]

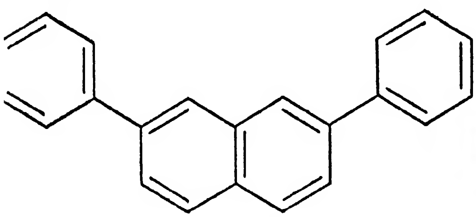
**2,6-Diphenylnaphthalene**



M. P., °C

233–234[31] 230[28]

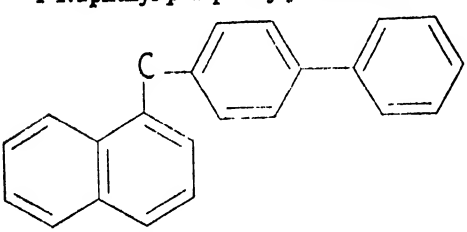
**2,7-Diphenylnaphthalene**



M. P., °C 143[21]

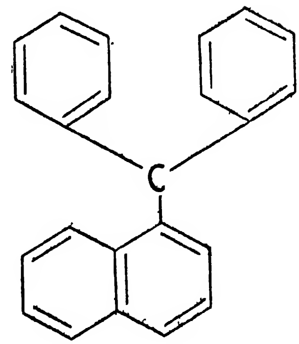
$C_{23}H_{18}$

**1-Naphthyl-*p*-biphenylylmethane**




M. P., °C 146[27]

**1-Benzhydrylnaphthalene**




M. P., °C

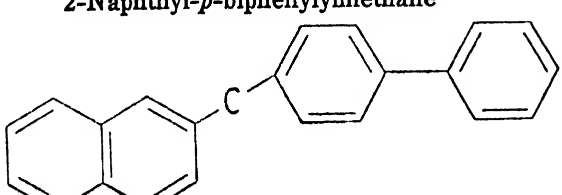
150
152[25]
150.5[33, 34]
150 (a)
149.5[22]
149 (b)[6, 7, 8, 23]
148–149[10]
134 (b)[6, 7, 8, 23]

$D_4^{20}$

1.190 0°[37]

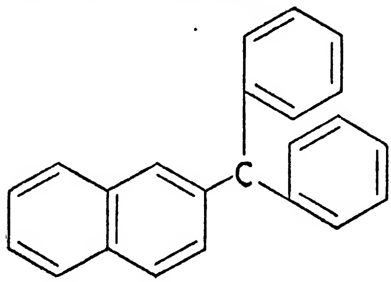
(a) The melting point 150 is found in references 1, 2, 3, 20, 24, 32, 38.
(b) These constants were determined on different crystalline forms.

**2-Naphthyl-*p*-biphenylylmethane**



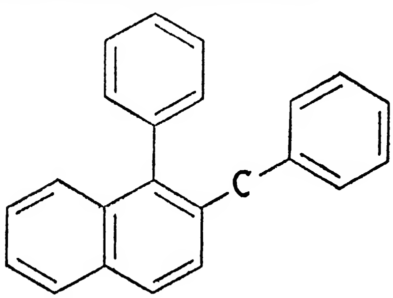

M. P., °C 111[26]

**2-Benzhydrylnaphthalene**



M. P., °C
77–78[19]
73–74[25]

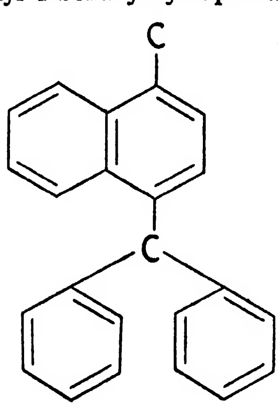
**1-Phenyl-2-benzylnaphthalene**



M. P., °C
87–88[9]

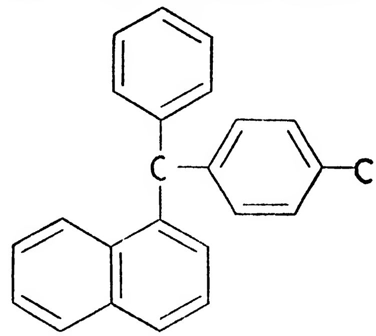
$C_{24}H_{20}$

**1-Methyl-4-benzhydrylnaphthalene**



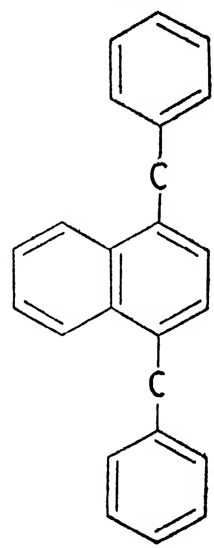
M. P., °C
149[6]

**Phenyl-*p*-tolyl-1-naphthylmethane**



M. P., °C
133[12]

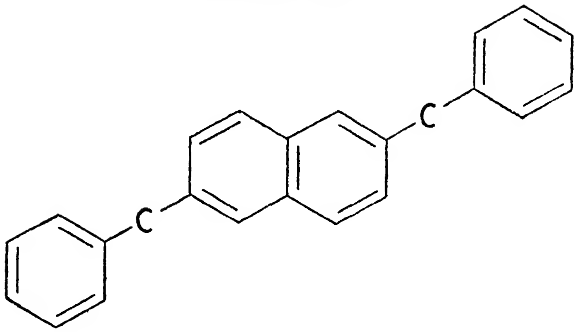
**1, 4-Dibenzylnaphthalene**



M. P., °C
88[15, 16, 17]

*This series continued on next page*

**2,6-Dibenzylnaphthalene**



M. P., °C
123[18]

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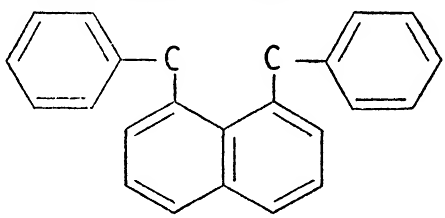
**1,8-Dibenzylnaphthalene**



M. P., °C
146.5[15, 16, 35]

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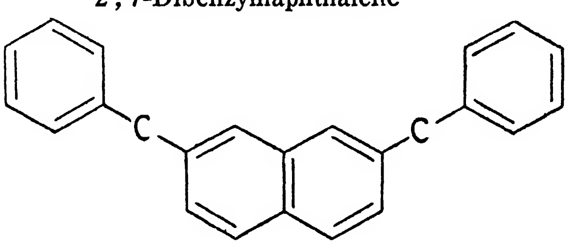
**2,7-Dibenzylnaphthalene**



M. P., °C
91[18]

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**x,x-Dibenzylnaphthalene** (a)

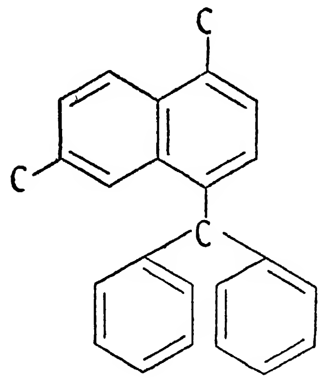
M. P., °C
132[15]

B. P., °C @ 760mm
265–275 9[29]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{25}H_{22}$

### 1,6-Dimethyl-4-benzhydrylnaphthalene



M. P., °C
134–135[6]

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*References on Naphthalene with Two Phenyl or One Biphenylyl Substitutions*


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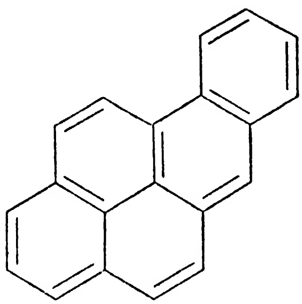
## 3. BENZOPYRENES AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-28}$

### $C_{20}H_{12}$

**1,2-Benzopyrene**



M. P., °C

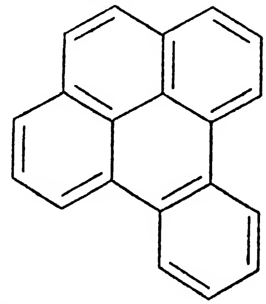
**177.8**
178.6–179.8[2]
178.8–179.3[10]
178.5–179[8]
178.5–179 (a)[18]
176.5–177.5[5, 14]
176.5–177.5 (a)[17]
177[22, 23]
176.5–177[7]
176.3–177.0[6]
175.5–176.5[14]
176[24]
174–176 (a)[15]
175[19]

$D_4^{20}$

1.351 (solid)[12]
1.282 (b) (solid)[12]

(a) This compound was given as 1,2-Benzopyrene in the literature, but no structural formula or indication of the numbering system used was given.
(b) The temperature of this determination was not given.

**4,5-Benzopyrene**

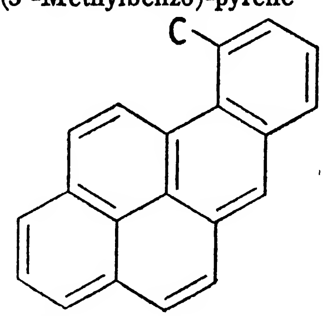


M. P., °C

178–179[5]
178[4]
174[11]

### $C_{21}H_{14}$

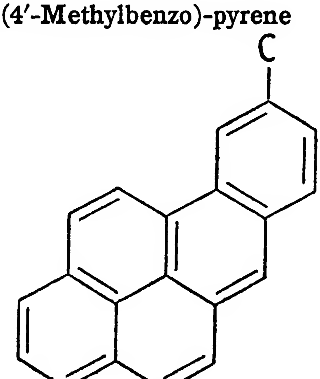
**1,2-(3′-Methylbenzo)-pyrene**



M. P., °C

190–191[13]
190–190.8[1]

**1,2-(4′-Methylbenzo)-pyrene**



M. P., °C
139–140 (a)[1]
138–139 (b)[8]

B. P., °C @ 760mm
175 0.01[1]

(a) This compound remelts at 140–140.4.
(b) This compound remelts at 140–140.2.

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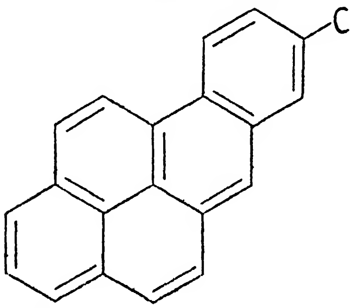
**1,2-(5′-Methylbenzo)-pyrene**




M. P., °C
147.5–148 (a)[1]
146.5–147.5[8]
146.5–147 (a)[8]

B. P., °C @ 760mm
220 0.01[1]

(a) This compound remelts at 147.6–148.1.

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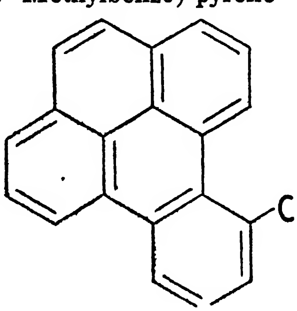
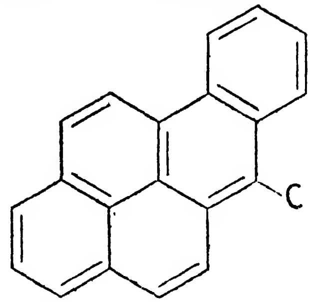
**4,5-(3′-Methylbenzo)-pyrene**




M. P., °C
219.5–220[10]
217.5–218[10]

**3-Methyl-1,2-benzopyrene**




M. P., °C
216.6–217.3[6]
216.2–216.7[9]
215.7–216.2[9]

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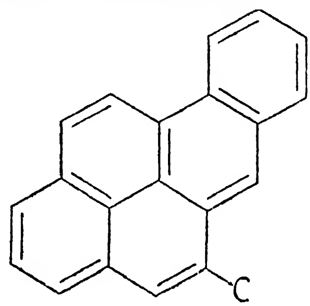
**4-Methyl-1,2-benzopyrene**




M. P., °C
171–172.5[16]
171–172[20]
171–171.5[9]

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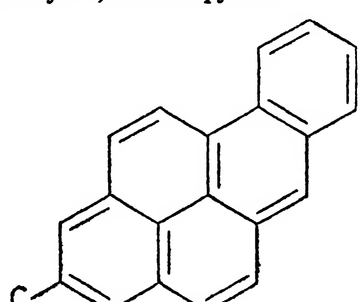
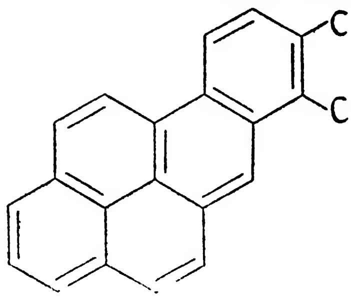
**7-Methyl-1,2-benzopyrene**




M. P., °C
157.5–159.5[9]

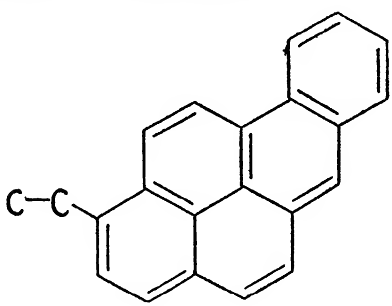
## $C_{22}H_{16}$

### 1,2-(5',6'-Dimethylbenzo)-pyrene



M. P., °C
215–216[1]

### 8-Ethyl-1,2-benzopyrene



M. P., °C
112[21]

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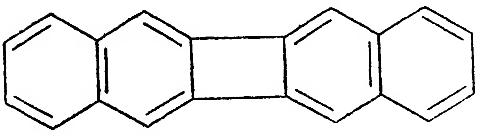
## 4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-28}$

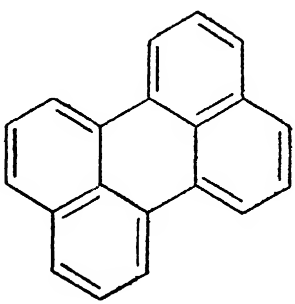
### $C_{20}H_{12}$

**1,2,3,4-Di-(3′,2′-naphtho)-cyclobutane**



M. P., °C
365 ± 2[50]

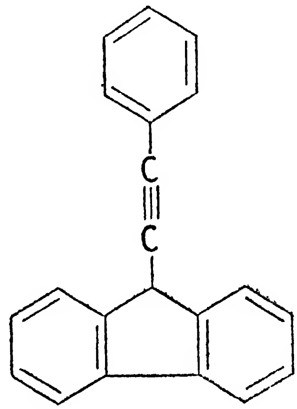
**Perylene**



M. P., °C
275
277.9–279.1[26]
279[49]
278[46]
274[33]
273–274[44]
273[63]
272–273[25]
271[64]
267[48]
266[12]
265[38]

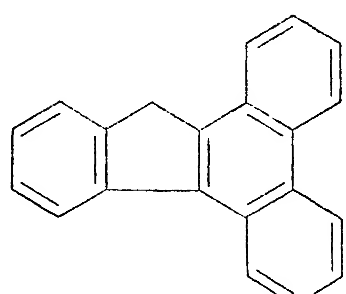
### $C_{21}H_{14}$

**Phenyl-(9′-fluoryl)-ethyne**



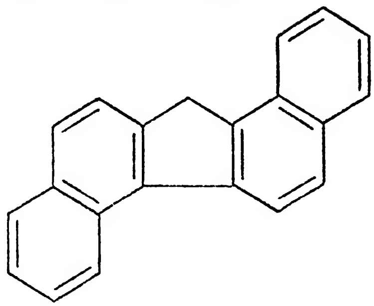
M. P., °C
98–100[34]

**1,2,3,4-Dibenzofluorene**



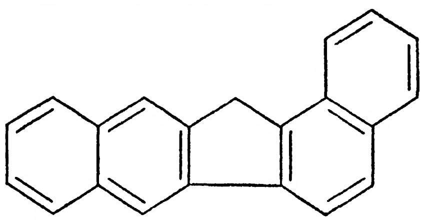
M. P., °C
158–160[57]
158–159[7]
157.5–158.5[43]

**1,2,5,6-Dibenzofluorene**



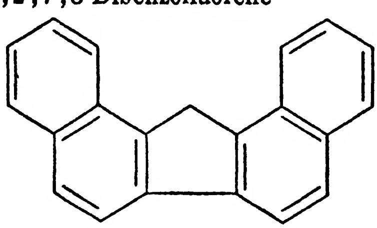
M. P., °C
171–172[21]

**1,2,6,7-Dibenzofluorene**



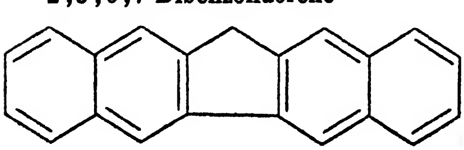
M. P., °C
294[24]

**1,2,7,8-Dibenzofluorene**



M. P., °C
242.5[53]
234[13]
232[14]
230[10]
228–230[36]

**2,3,6,7-Dibenzofluorene**



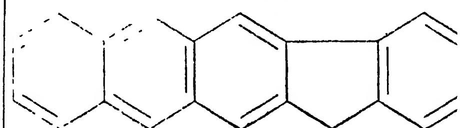
M. P., °C
282.5–283.5[42]
281–282[24]

**x,x,x,x-Dibenzofluorene** (a)

M. P., °C
306[4]
190.5[52]

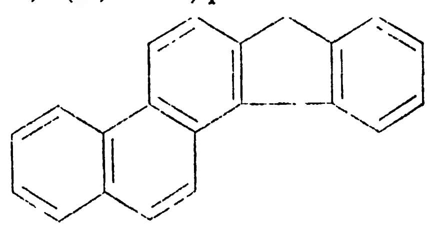
(a) The structure of these compounds was not clearly defined in the literature.

**2,3-(3′,2′-Indo)-anthracene**



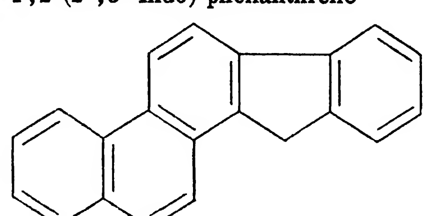
M. P., °C
317[5]

**1,2-(3′,2′-Indo)-phenanthrene**



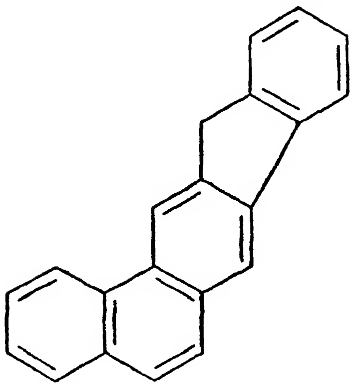
M. P., °C
189[11]

**1,2-(2′,3′-Indo)-phenanthrene**



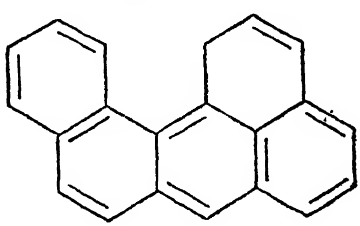
M. P., °C
338–339[20]
328[2]
327–328[22, 23]

**2,3-(3′,2′-Indo)-phenanthrene**



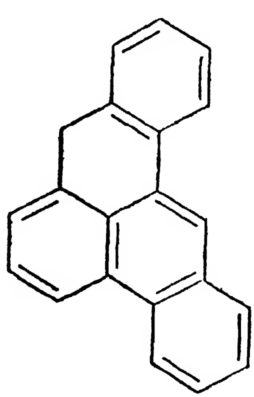
M. P., °C
226–226.5[21]

**8,9-(2′,1′-Naphtho)-phenalene**



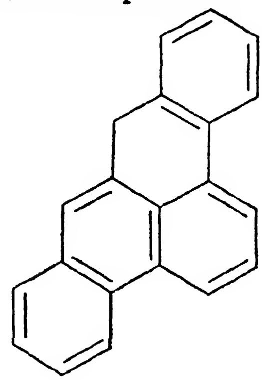
M. P., °C
149–149.5[28A]

**2,3,5,6-Dibenzophenalene**



M. P., °C
128–129[15]

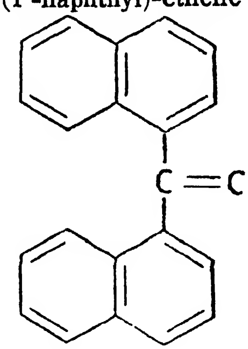
**2,3,7,8-Dibenzophenalene**



M. P., °C
171–172.5[15]

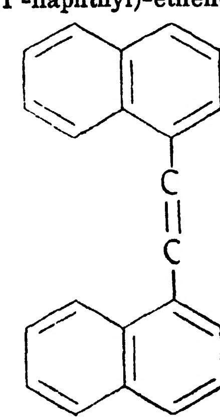
## $C_{22}H_{16}$

**1,1-Di-(1′-naphthyl)-ethene**



M. P., °C
107[47]

**1,2-Di-(1′-naphthyl)-ethene**



M. P., °C
161–162[54]
161[8, 28, 61]
160[45]
158.5–159[30]

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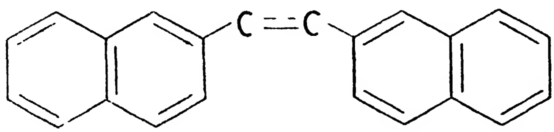
**1,2-Di-(2′-naphthyl)-ethene**



M. P., °C
255[61]
254–255[29, 60]
253–254[54]

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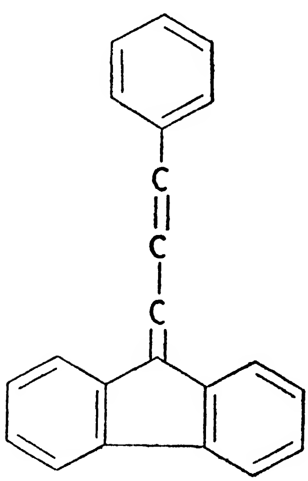
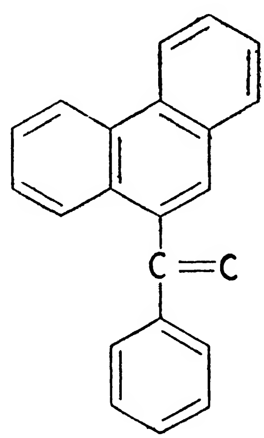
**1-Phenyl-3-(9′-fluorylidene)-propene-1**



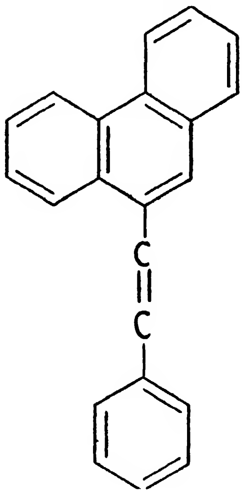
M. P., °C
155[35]
154–155[62]
154.5[55]

**1-Phenyl-1-(9′-phenanthryl)-ethene**



M. P., °C
142[6]

**1-Phenyl-2-(9′-phenanthryl)-ethene**



M. P., °C
118[6]

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**x-Phenyl-x, x-dihydrobenzo-[jk]-fluorene** (a)

M. P., °C
148[56]

(a) The structure of this compound was not clearly defined in the literature.

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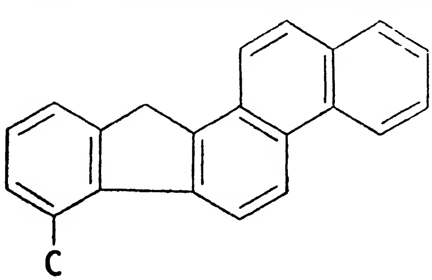
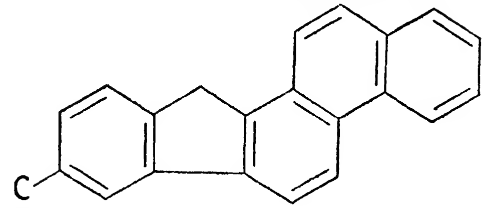
**1,2-(2′,1′-Naphtho)-5-methylfluorene**



M. P., °C
275–276[2]
275[61]

**1,2-(2′,1′-Naphtho)-6-methylfluorene**



M. P., °C
330[2]

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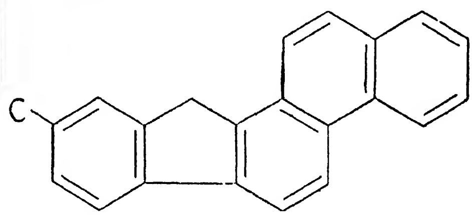
**1,2-(2′,1′-Naphtho)-7-methylfluorene**



M. P., °C
334–336[2]
301[13]

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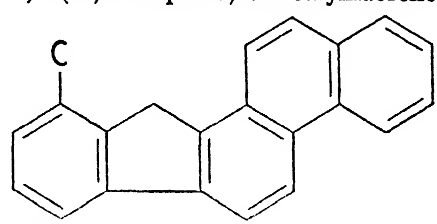
**1,2-(2′,1′-Naphtho)-8-methylfluorene**



M. P., °C
281–281.5[2]

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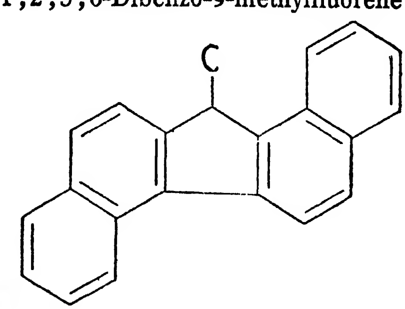
**1,2,5,6-Dibenzo-9-methylfluorene**



M. P., °C
144–145[21]

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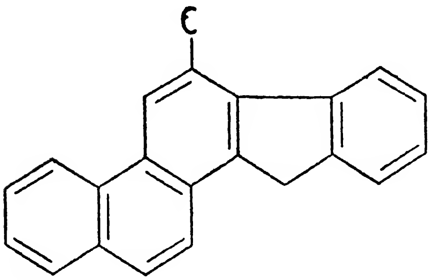
**1,2-(2′,3′-Indo)-3-methylphenanthrene**



M. P., °C
202–203[2]

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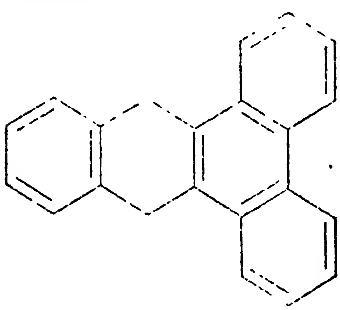
**1,2,3,4-Dibenzo-9,10-dihydroanthracene**



M. P., °C
202–203[3]

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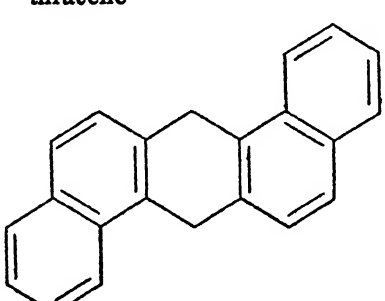
**1,2,5,6-Dibenzo-9,10-dihydroanthracene**



M. P., °C
218.5–219.5[1]
196–198[19]

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**1,2-Benzo-x,x-dihydronaphthacene** (a)

M. P., °C
157–160.5[3]

(a) The hydrogens may be in either the 5,8- or 9,10-positions.

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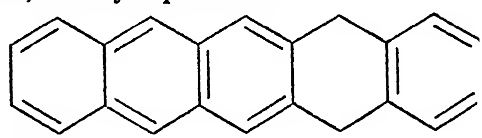
**5,14-Dihydropentacene**



M. P., °C
273[16]

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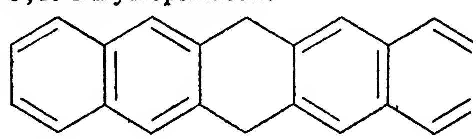
**6,13-Dihydropentacene**



M. P., °C
271–272[41]
270[17, 39, 40]

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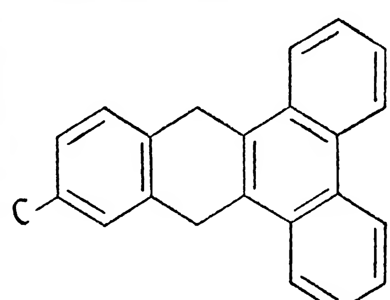
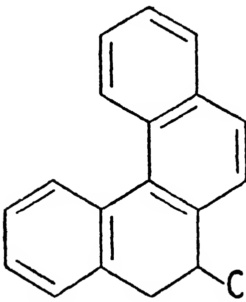
## $C_{23}H_{18}$

**1,2,3,4-Dibenzo-6-methyl-9,10-dihydroanthracene**



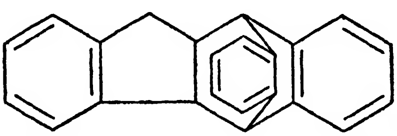
M. P., °C
207–209.5[3]

**11,12-Benzo-5-methyl-5,6-dihydrochrysene**



M. P., °C
151–152[9]

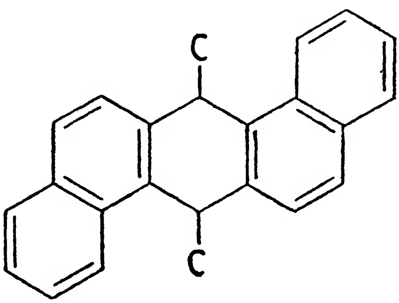
**1,4-*o*-Endophenylene-2,3-benzo-1,4,4a,9a-tetrahydrofluorene**



M. P., °C
118[37]

## $C_{24}H_{20}$

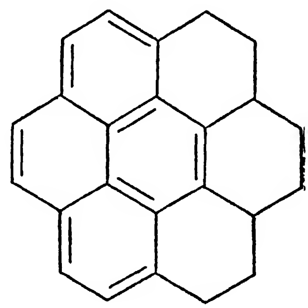
**1,2,5,6-Dibenzo-9,10-dimethyl-9,10-dihydroanthracene**



M. P., °C
277–278 (a)[18]
207–209 (b)[18]

(a) This constant was determined on the *trans* isomer of the compound.
(b) This constant was determined on the *cis* isomer of the compound.

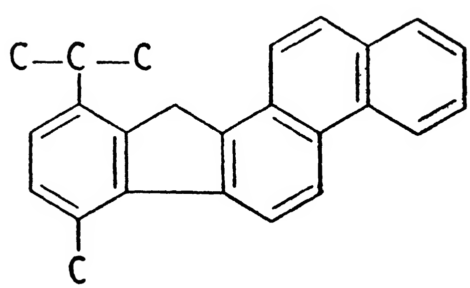
**1,2,2a,3,4,4a,5,6-Octahydrocoronene**



M. P., °C
269–270[30]

## $C_{25}H_{22}$

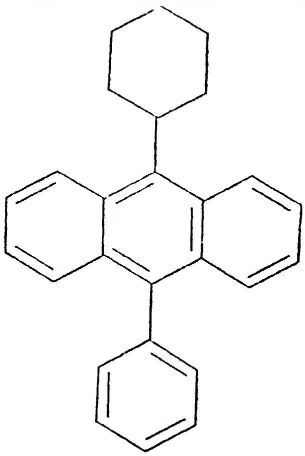
**1,2-(2′,1′-Naphtho)-5-methyl-8-isopropylfluorene**



M. P., °C
198[22,23]

## $C_{26}H_{24}$

**9-Cyclohexyl-10-phenylanthracene**



M. P., °C
231–232[58, 59]

## $C_{27}H_{26}$

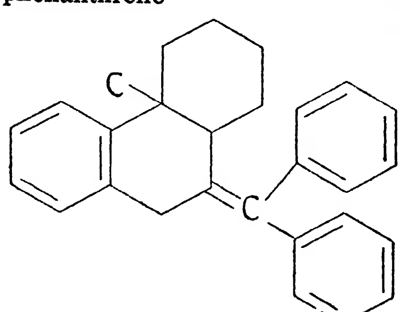
**2,7-Dibenzyl-$x_4$-tetrahydrofluorene (a)**

M. P., °C
90–91[27]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{28}H_{28}$

**4a-Methyl-10-benzhydrylidene-1,2,3,4,4a,9,10,10a-octahydrophenanthrene**



M. P., °C
126[31]

## $C_{30}H_{32}$

**1-Methyl-7-isopropyl-x,x-diphenyl-$x_6$-hexahydrophenanthrene (a)**

M. P., °C
82[32]

(a) The structure of this compound was not clearly defined in the literature.

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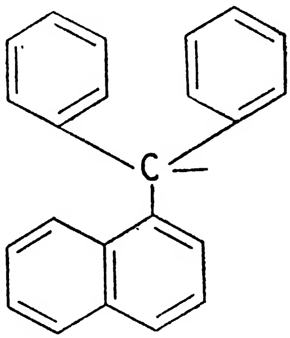
# XII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-29}$

# XII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-29}$

$C_{23}H_{17}$

**Diphenyl-(1-naphthyl)-methyl**



M. P., °C
135–137[1, 2]

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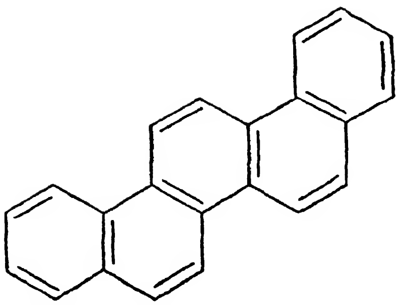
# XIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-30}$

1. Picene and Its Alkyl Derivatives
2. Dibenzoanthracenes, Dibenzophenanthrenes, and Their Alkyl Derivatives
3. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-30}$

## 1. PICENE AND ITS ALKYL DERIVATIVES, $C_nH_{2n-30}$

### $C_{22}H_{14}$

**Picene**



M. P., °C
**365**
366.0–366.5[6]
365–366[11,14,18]
363.5–364.5[3]
364[1,2,16]

B. P., °C @ 760mm
518–520[4]

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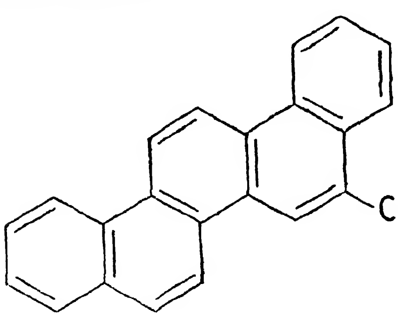
### $C_{23}H_{16}$

**5-Methylpicene**



M. P., °C
251.6–252.2[6]

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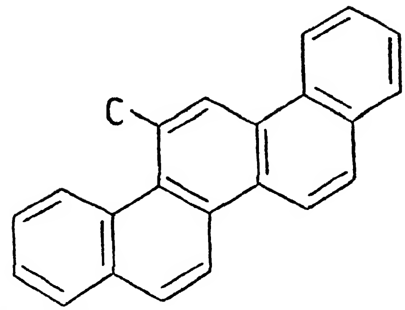
**13-Methylpicene**



M. P., °C
203.6–204.4[6]

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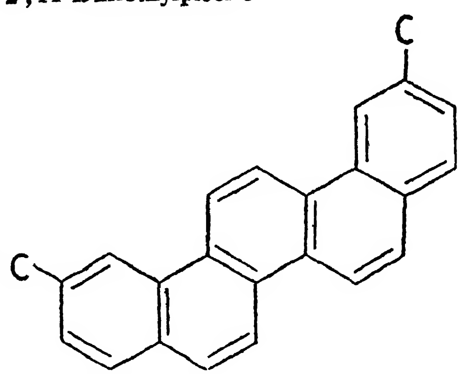
### $C_{24}H_{18}$

**2,11-Dimethylpicene**



M. P., °C
293–294[12]

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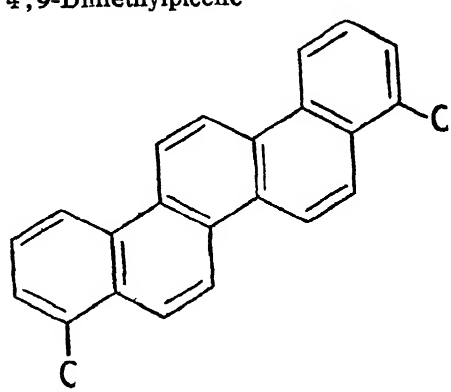
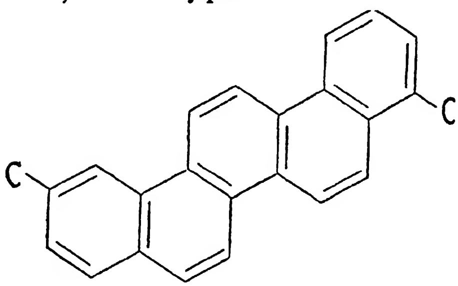
**4,9-Dimethylpicene**



M. P., °C
380-381[10]
370-371[7]

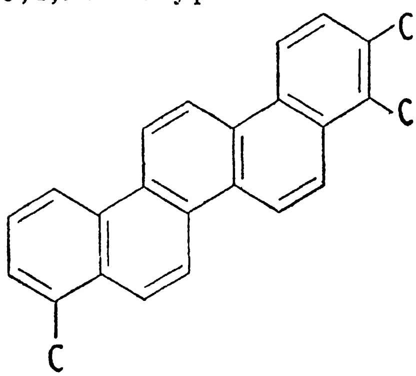
**4,11-Dimethylpicene**



M. P., °C
306[10, 13]
305-306[8, 9]

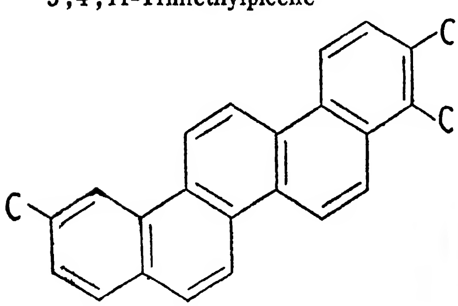
$C_{25}H_{20}$

**3,4,9-Trimethylpicene**



M. P., °C
380-381[10]
372-373[7]

**3,4,11-Trimethylpicene**



M. P., °C
309-310[10]
308-310[12]

B. P., °C @ 760mm
270 0.1[12]

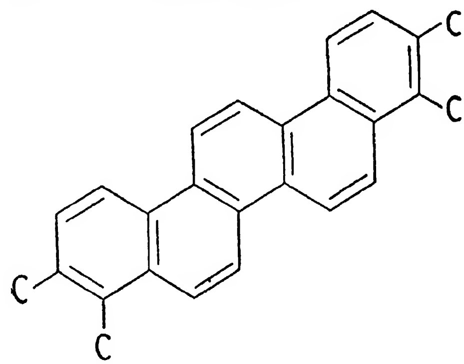
**x,x,x-Trimethylpicene (a)**

M. P., °C
306[15]
305-306[17]
298[5]

(a) The structure of this compound was not clearly defined in the literature.

$C_{26}H_{22}$

**3,4,9,10-Tetramethylpicene**



M. P., °C
400-401[10]

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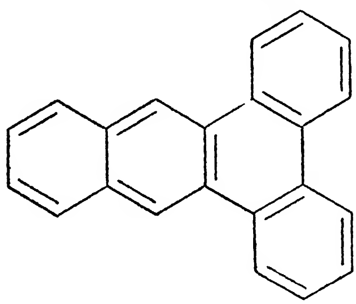
## 2. DIBENZOANTHRACENES, DIBENZOPHENANTHRENES, AND THEIR ALKYL DERIVATIVES, $C_nH_{2n-30}$

### $C_{22}H_{14}$

**1,2,3,4-Dibenzoanthracene**



M. P., °C
205[7]
203–204[16]
200–202[2]
200–201.5[4]

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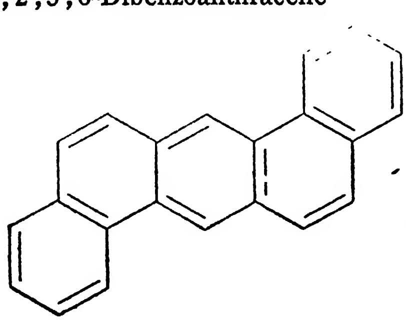
**1,2,5,6-Dibenzoanthracene**



M. P., °C
264.5
266.6–266.9[17]
266–266.5[20]
265.5–266.0[26]
263.5–264.5[25]
262.7–264.0[17]
262[6, 29]
261–262[22]
261–261.5[16, 18]
260[24]

$D_4^{20}$
1.282 (a)[24]

(a) The temperature of this determination was not given.

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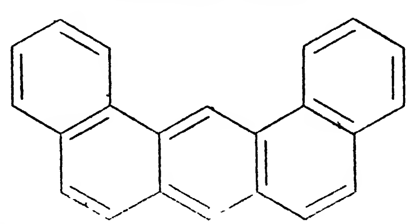
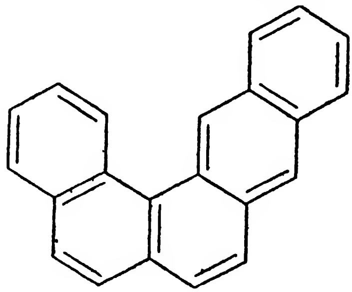
**1,2,7,8-Dibenzoanthracene**



M. P., °C
198.0–198.4[17]
196[14]
195–196[27]

**2,3,5,6-Dibenzophenanthrene**



M. P., °C
261[11]
137–138[23]

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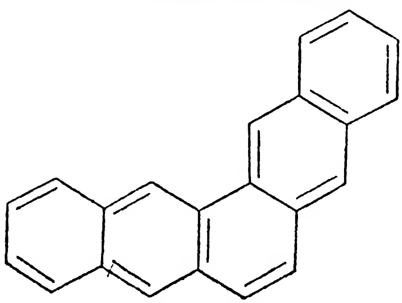
**2,3,6,7-Dibenzophenanthrene**



M. P., °C
257[8]
255–257[30]
250–251[10]

Additional Data
Sublimation Temp. (°C)
230 12mm[10]

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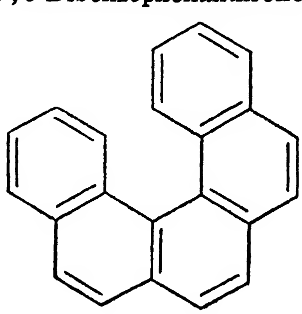
**3,4,5,6-Dibenzophenanthrene**



M. P., °C
177–178[15]
177[28]
145–146[29]

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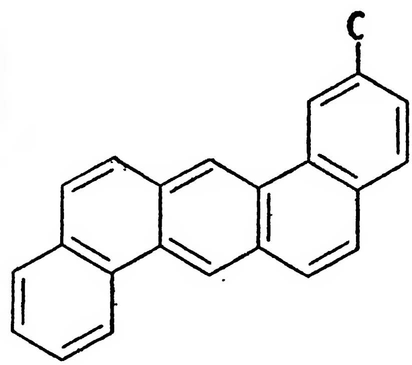
**$C_{23}H_{16}$**

**1,2-(4′-Methylbenzo)-5,6-benzoanthracene**



M. P., °C
256–257.5[12, 13]

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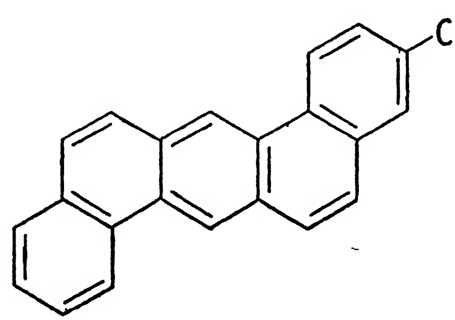
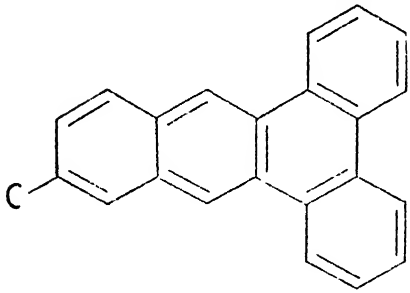
**1,2-(5′-Methylbenzo)-5,6-benzoanthracene**



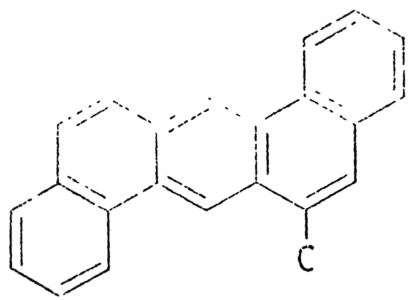
M. P., °C
245[12, 13, 16]
244–245[19]

**1,2,3,4-Dibenzo-6-methylanthracene**



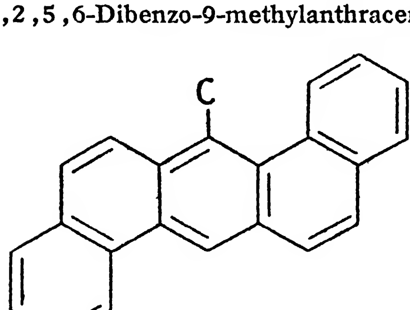
M. P., °C
157.5–158[4]

**1,2,5,6-Dibenzo-4-methylanthracene**



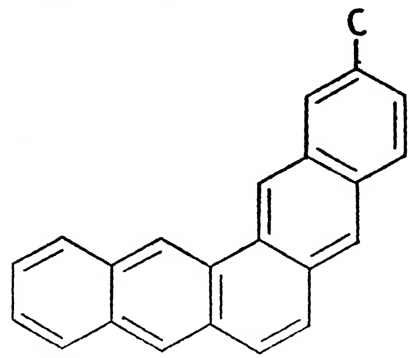
M. P., °C
184–185[16]

**1,2,5,6-Dibenzo-9-methylanthracene**



M. P., °C
192–194.5[21]

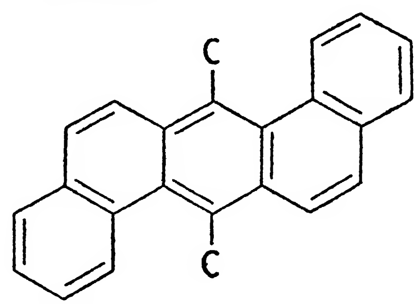
**2,3-(4′-Methylbenzo)-6,7-benzophenanthrene**



M. P., °C
315–316[9]

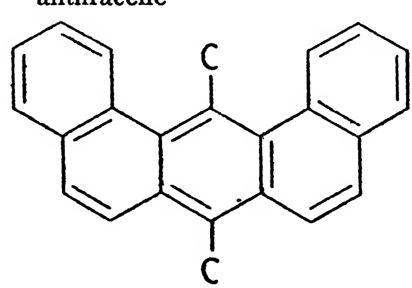
## $C_{24}H_{18}$

**1,2,5,6-Dibenzo-9,10-dimethylanthracene**



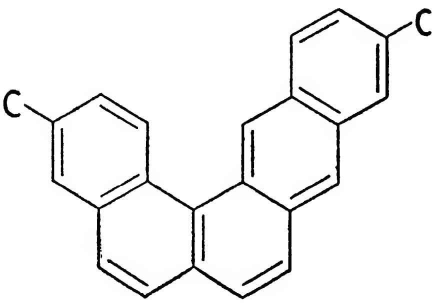
M. P., °C
205.5–206.5[3,13]
203–204[1]

**1,2,7,8-Dibenzo-9,10-dimethylanthracene**



M. P., °C
205.5–206.5[12]

**2,3-(5′-Methylbenzo)-5,6-(4′-methylbenzo)-phenanthrene**



M. P., °C
228[11]

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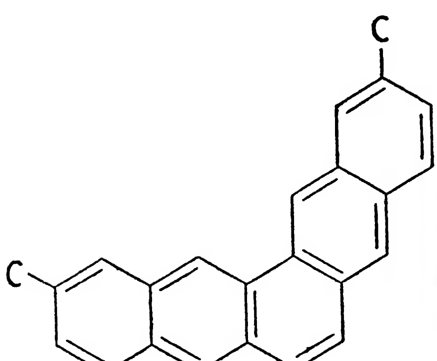
**2,3-(4′-Methylbenzo)-6,7-(5′-methylbenzo)-phenanthrene** (a)



M. P., °C
325[5]

(a) More information about this compound is found in references 8 and 10. The physical constants in these references were found to be in error.

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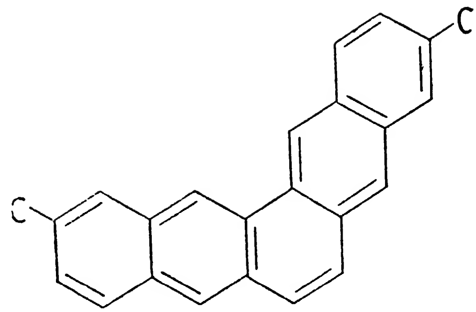
**2,3,6,7-Di-(5′-methylbenzo)-phenanthrene** (a)



M. P., °C
325[5]

(a) More information about this compound is found in references 8 and 10. The physical constants in these references were found to be in error.

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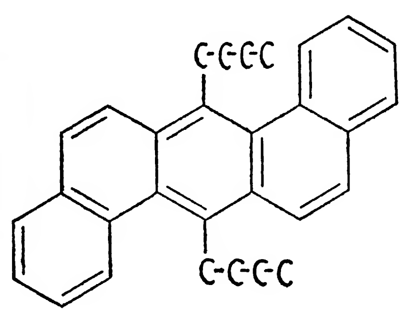
$C_{30}H_{30}$

**1,2,5,6-Dibenzo-9,10-di-*n*-butyl-anthracene**



M. P., °C
143.5–144.5[12,13]

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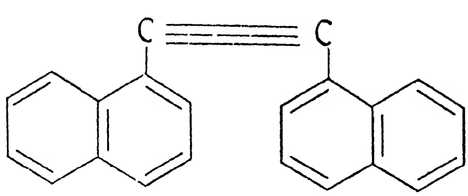
## 3. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-30}$

### $C_{22}H_{14}$

**Di-(1′-naphthyl)-ethyne**



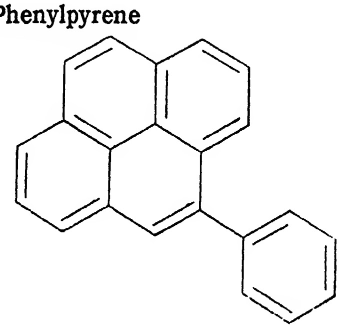
M. P., °C
225[25]
171[33, 34]

**x-Phenylbenzo-[jk]-fluorene (a)**

M. P., °C
144[48]

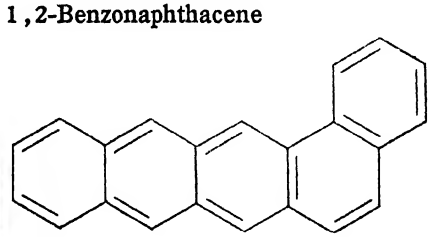
(a) The structure of this compound was not clearly defined in the literature.

**4-Phenylpyrene**



M. P., °C
169[47]

**1,2-Benzonaphthacene**



M. P., °C
263–264[3,12,15,16]

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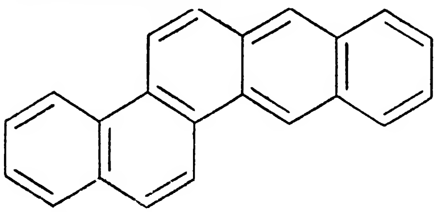
**2,3-Benzochrysene**



M. P., °C
293–294[12,16]
293[14]

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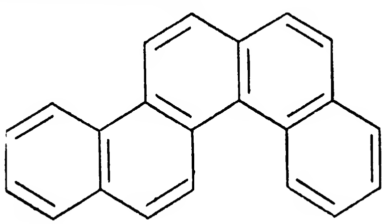
**3,4-Benzochrysene**



M. P., °C
128[4,50]
126–127[28]
122[49]

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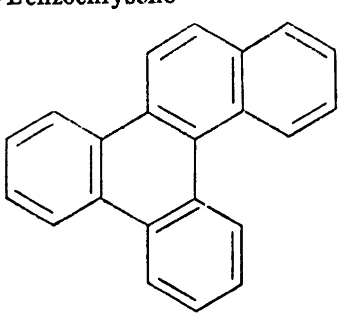
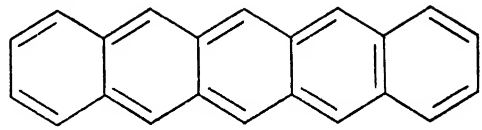
**5,6-Benzochrysene**



M. P., °C
115–116[9]
114.5–115[26,27]

**Pentacene**



M. P., °C
270–271[38,39]

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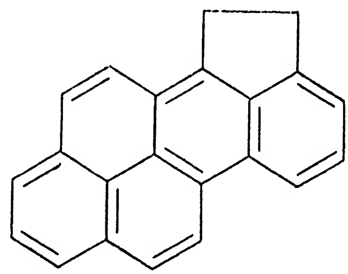
**Benzo-[hij]-cholanthrene**



M. P., °C
255–256[2]
252–253[36,37]

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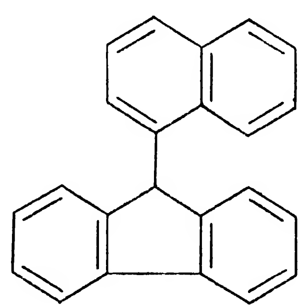
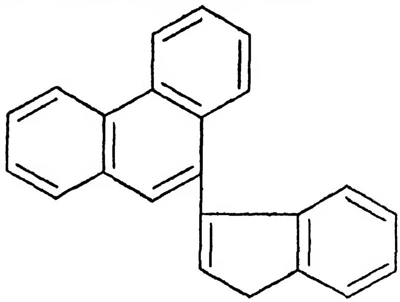
$C_{23}H_{16}$

**9-(1′-Naphthyl)-fluorene**



M. P., °C
113[31]
109–110[46]
103.5[45]

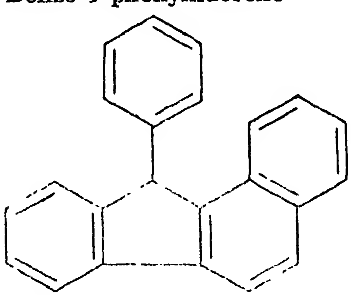
### 9-(3′-Indenyl)-phenanthrene



M. P., °C
121.5[5]

B. P., °C @ 760mm
230 0.7[5]

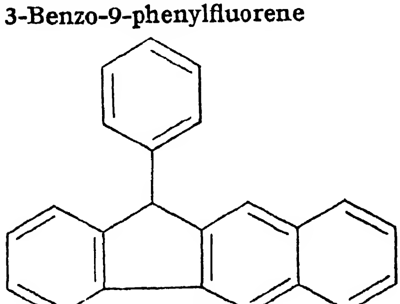
### 1,2-Benzo-9-phenylfluorene



M. P., °C
196[13, 31]
195.5[44]
195[6]
194[17]

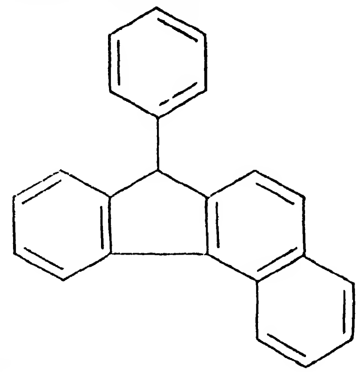
$D_4^{20}$
1.242 0° [53]

### 2,3-Benzo-9-phenylfluorene



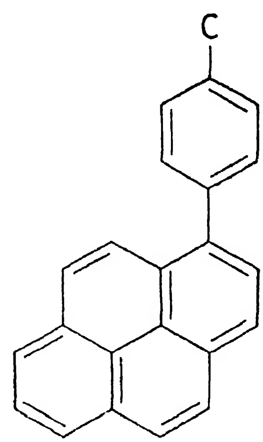
M. P., °C 137[24, 44]

### 3,4-Benzo-9-phenylfluorene



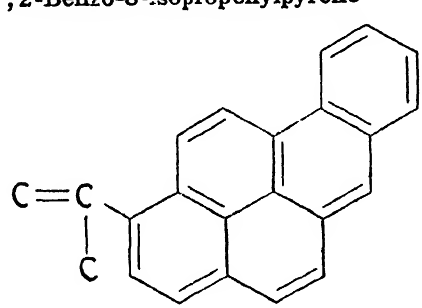
M. P., °C
135–138[13]

### 1-*p*-Tolylpyrene




M. P., °C
155–156[41]

### 1,2-Benzo-8-isopropenylpyrene



M.P., °C
114–115[51]

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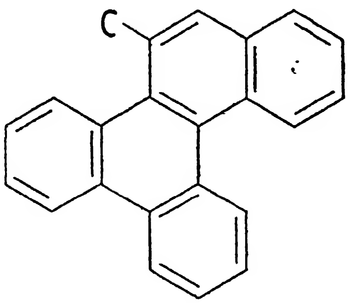
5,6-Benzo-11-methylchrysene



M.P., °C
163.5–164[10]

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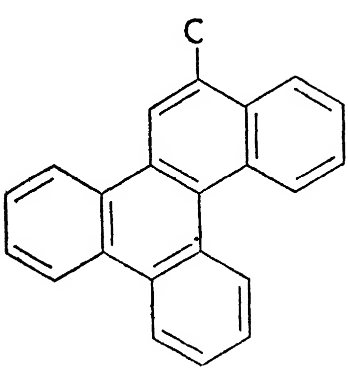
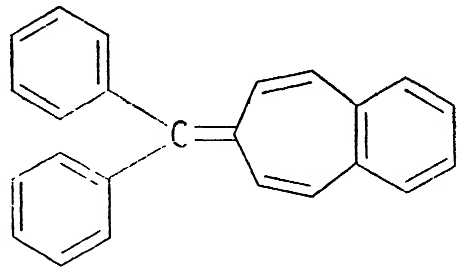
5,6-Benzo-12-methylchrysene



M.P., °C
150.5–151.5[10]

## $C_{24}H_{18}$

1,2-Benzo-5-benzhydrylidenecyclo-heptadiene-3,6



M.P., °C
92[43]

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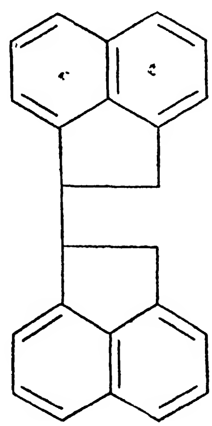
1,1′-Biacenaphthenyl



M.P., °C
120[18,19,21]

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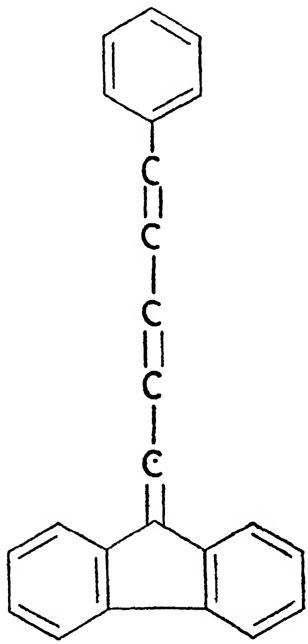
x,x′-Biacenaphthenyl (a)

M.P., °C
174[23]

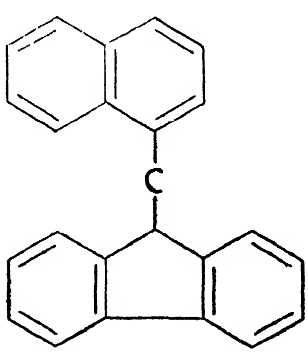
(a) The structure of this compound was not clearly defined in the literature.

**1-Phenyl-5-(9′-fluorylidene)-pentadiene-1,3**



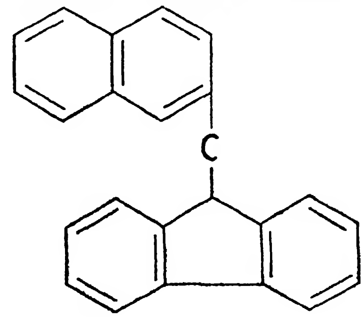
M. P., °C
155.5[32]

**(1-Naphthyl)-(9′-fluoryl)-methane**



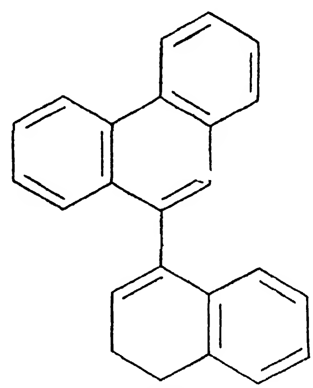
M. P., °C
135[40]
133–134[42]

**(2-Naphthyl)-(9′-fluoryl)-methane**



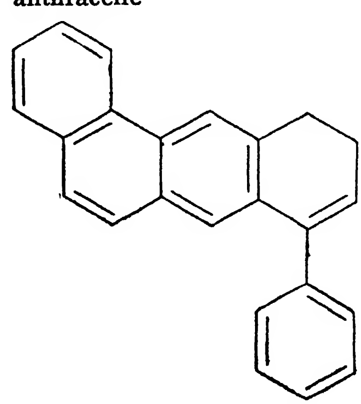
M. P., °C
164[42]

**9-[4′-(1′,2′-Dihydronaphthyl)]-phenanthrene**



M. P., °C 181.5[5]

**7,8-Benzo-5-phenyl-1,2-dihydroanthracene**



M. P., °C
125–126[1]

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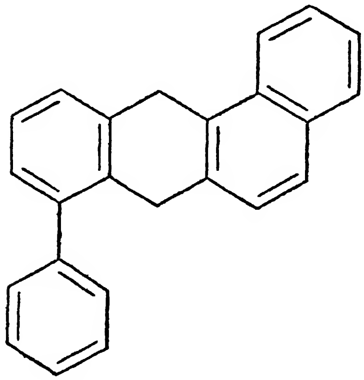
1,2-Benzo-5-phenyl-9,10-dihydroanthracene



M. P., °C
96–96.5[3]

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Crackene (a)
M. P., °C
309–310[7]
308[29, 30]

(a) The structure of this compound was not clearly defined in the literature. It may be a dimethyl picene or a dinaphthylbutene.

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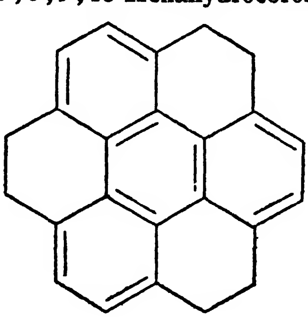
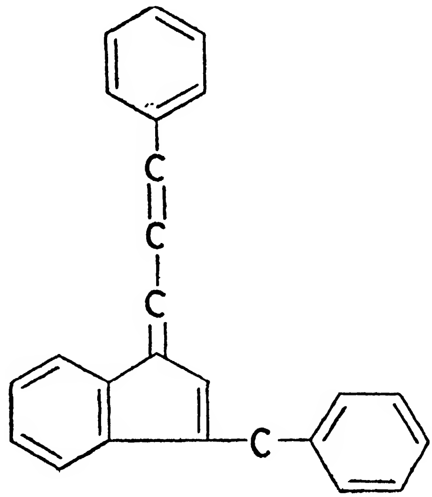
1,2,5,6,9,10-Hexahydrocoronene



M. P., °C
271–272[22]

$C_{25}H_{20}$

1-Phenyl-3-(3′-benzylindenylidene)-propene-1



M. P., °C
161–162[52]

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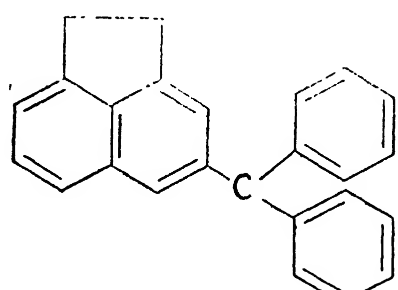
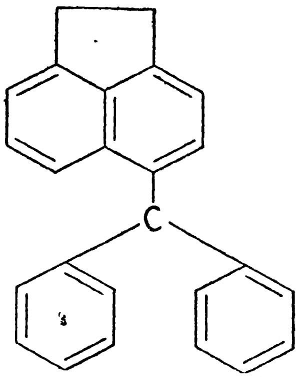
4-Benzhydrylacenaphthene



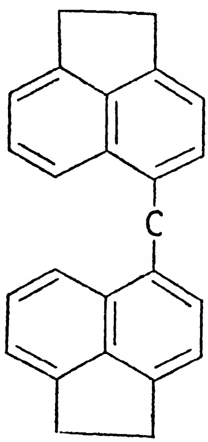
M. P., °C
176[35]

**5-Benzhydrylacenaphthene**



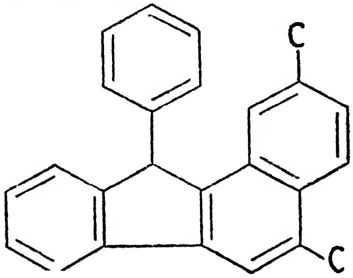

M. P., °C
167[8]

**Di-5,5′-acenaphthylmethane**



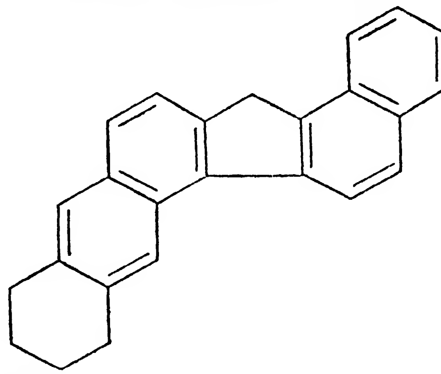

M. P., °C
140–141[20]

**1,2-(4′-Methylbenzo)-3-methyl-9-phenylfluorene**




M. P., °C
215[17]

**1,2-Benzo-5,6-[3′,2′-(5′,6′,7′,8′-tetrahydronaphtho)]-fluorene**



M. P., °C
160[11]

B. P., °C @ 760mm
330 2[11]

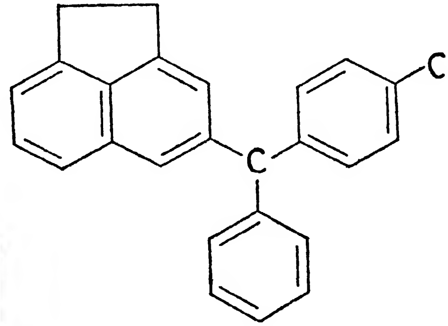
## $C_{26}H_{22}$

**x-Benzhydrylidene-x,x-dimethyl-x,x-benzocycloheptadiene-x,x (a)**

M. P., °C
128.5–129[43]

(a) The structure of this compound was not clearly defined in the literature.

**Phenyl-*p*-tolyl-(4-acenaphthyl)-methane**



M. P., °C
209[35]

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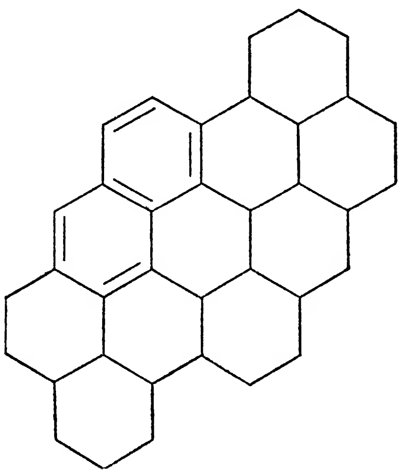
## $C_{36}H_{42}$

**Didecahydronaphtho-[3′,4′,5′-abc, 3″,4″,5″-jkl]-1,2,2a,3,4,4a, 5,6,6a,7,8,12c,12d,12e-tetradecahydrocoronene**



M. P., °C
262–263[22]

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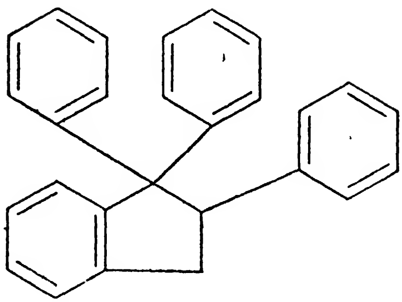
## XIV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-32}$

1. Indane with Three Phenyl Substitutions
2. Fluorene with Two Phenyl Substitutions
3. Dihydroanthracenes and Dihydrophenanthrenes with Two Phenyl Substitutions
4. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-32}$

## 1. INDANE WITH THREE PHENYL SUBSTITUTIONS, $C_nH_{2n-32}$

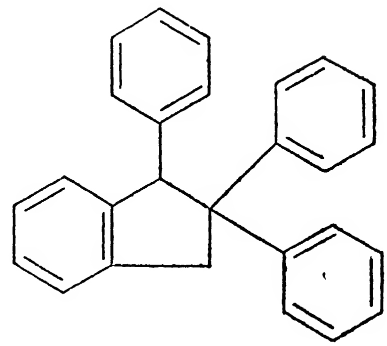
### $C_{27}H_{22}$

**1,1,2-Triphenylindane**



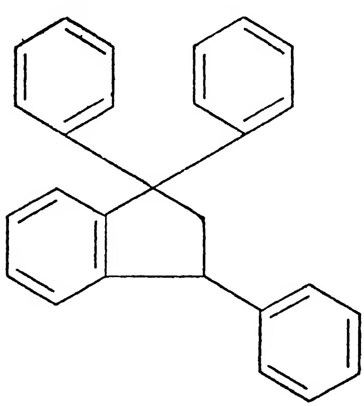
M. P., °C
83[7]

**1,2,2-Triphenylindane**



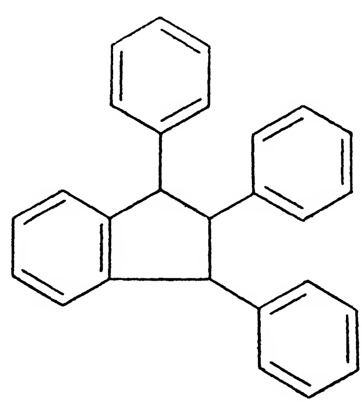
M. P., °C
140[7]

**1,1,3-Triphenylindane**



M. P., °C
112[2,7]
111–112[7]

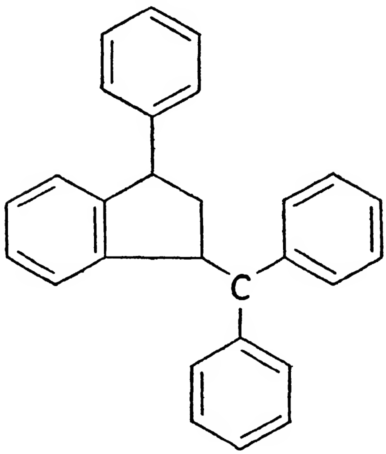
**1,2,3-Triphenylindane**



M. P., °C
154[6]
153[7]

## $C_{28}H_{24}$

### 1-Phenyl-3-benzhydrylindane



M. P., °C
- 137[7]
- 135 (a)[10]
- 133–135[5]
- 133[9]
- 131[7]
- 107 (b)[10]

(a) This constant was determined on the stabile form of the compound.

(b) This constant was determined on the labile form of the compound.

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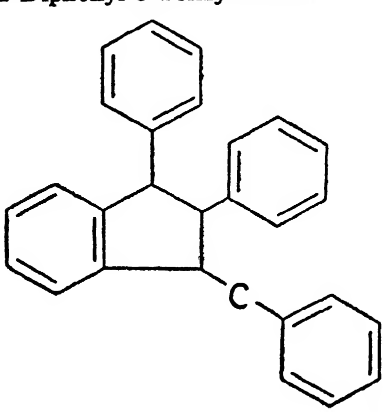
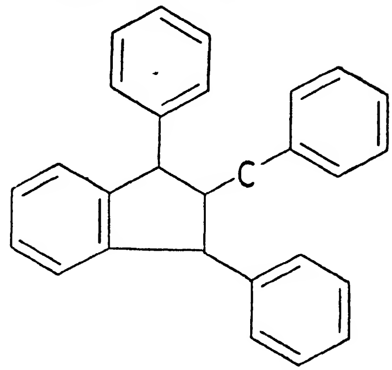
### 1,2-Diphenyl-3-benzylindane



M. P., °C 115[1,4]

### 1,3-Diphenyl-2-benzylindane



M. P., °C
- 121–122.5[4]

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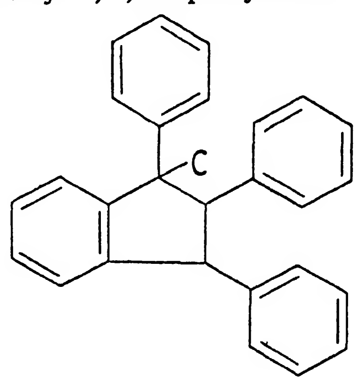
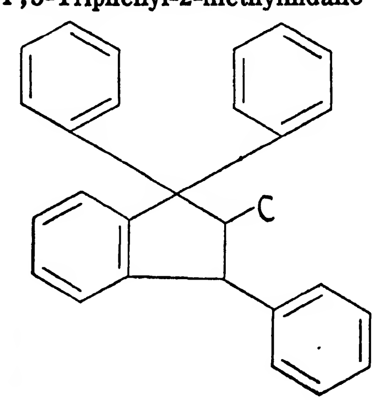
### 1-Methyl-1,2,3-triphenylindane



M. P., °C
- 163–165[3]
- 163–164[4]

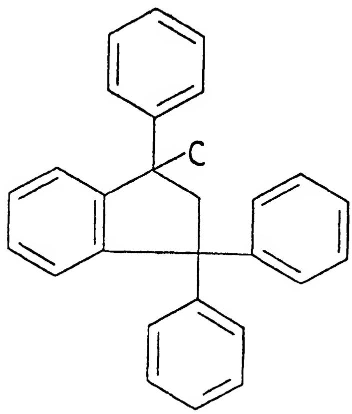
---

### 1,1,3-Triphenyl-2-methylindane



M. P., °C
165[4]

**1-Methyl-1,3,3-triphenylindane**



M. P., °C
143[2, 8]

*References on Indane with Three Phenyl Substitutions*

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2. Bergmann, E., and H. Weiss, Ann. **480,** 49 **1930.**
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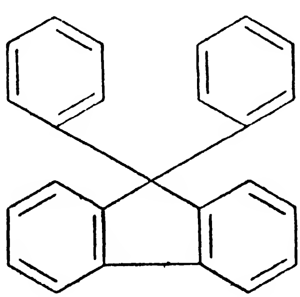
## 2. FLUORENE WITH TWO PHENYL SUBSTITUTIONS, $C_nH_{2n-32}$

$C_{25}H_{18}$

**9,9-Diphenylfluorene**

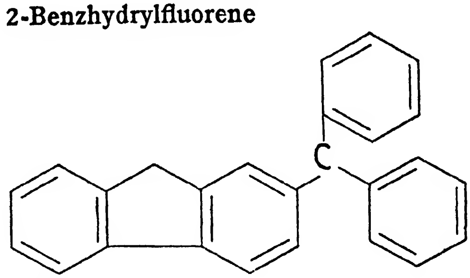


M. P., °C
222–223[16]
222[18]
219–220[1]

$D_4^{20}$
1.220 0°[19]

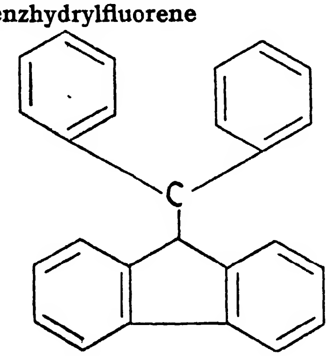
$C_{26}H_{20}$

**2-Benzhydrylfluorene**



M. P., °C
147–148[2]

**9-Benzhydrylfluorene**

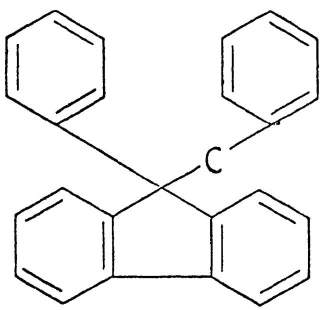


M. P., °C

217–218[7, 20]
217[9, 10, 12]
216–217[3]
187–189 (a)[3]
187 (a)[12]

(a) This constant was determined on an isomeric form of the compound.

**9-Phenyl-9-benzylfluorene**

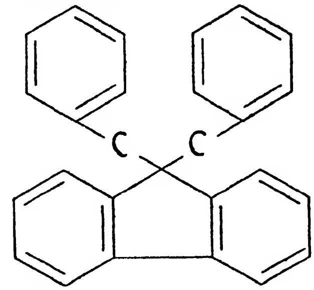


M. P., °C

139[11, 14]
136–137[8]
136–136.5[15]
136[6]
125–126 (a)[14]

(a) This constant was determined on an isomeric form of the compound.

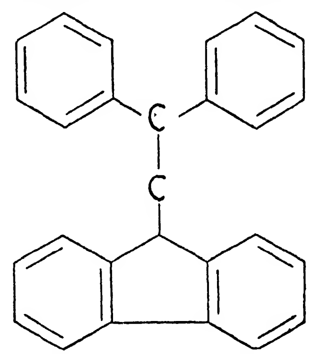
**9,9-Dibenzylfluorene**



M. P., °C

150–151[13]
147–148[17]

**1,1-Diphenyl-2-(9′-fluoryl)-ethane**

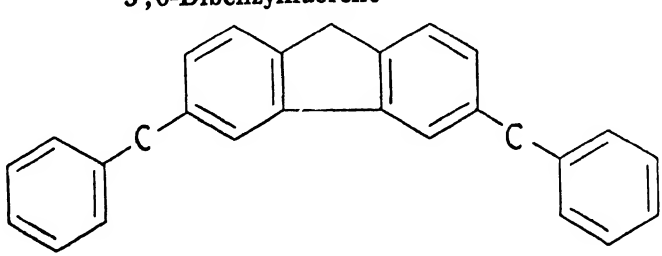


M. P., °C

107[12]

## $C_{27}H_{22}$

**3,6-Dibenzylfluorene**



M. P., °C

125[4, 5]

*References on Fluorene with Two Phenyl Substitutions*

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2. Bachmann, W. E., R. Hoffman, and F. Whitehead, J. Org. Chem. **8,** 320 **1943.**
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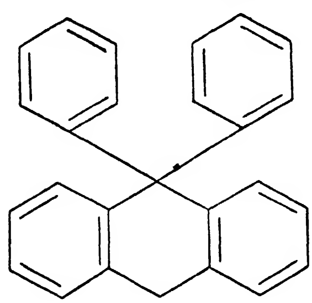
## 3. DIHYDROANTHRACENES AND DIHYDROPHENANTHRENES WITH TWO PHENYL SUBSTITUTIONS, $C_nH_{2n-32}$

### $C_{26}H_{20}$

**9,9-Diphenyl-9,10-dihydroanthracene**



M. P. °C
200[1]
195–196[10]
194–195[2,4]

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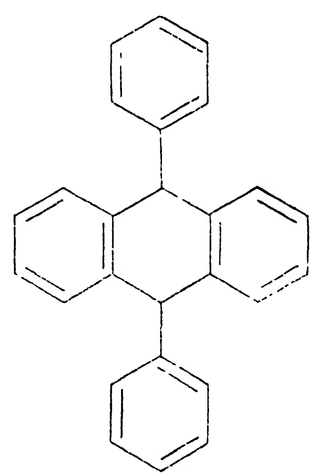
**9,10-Diphenyl-9,10-dihydroanthracene**



M. P., °C
227–228 (a)[7]
208[5]
198.5–199.5 (a)[7]
199 (b)[13]
190 (b)[13]

164.2[8, 11]
159[12]

B. P., °C @ 760mm
437[11]

(a) These constants were determined on isomeric forms.
(b) These constants were determined on different crystalline forms.

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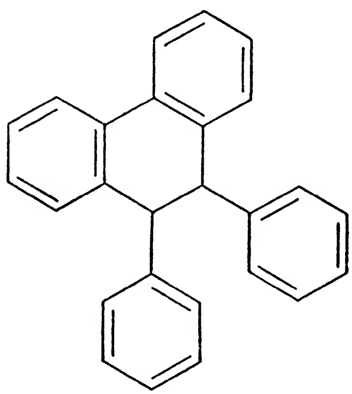
**9,10-Diphenyl-9,10-dihydrophenanthrene**



M. P., °C
130–131[13]

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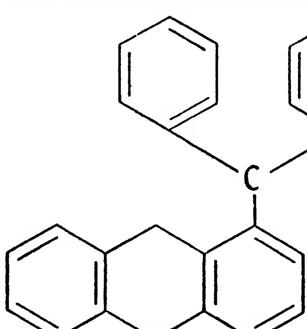
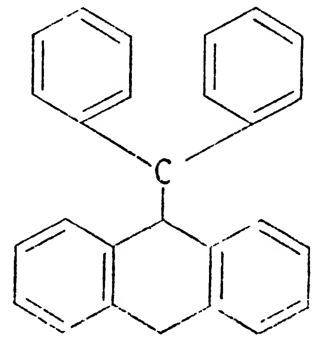
$C_{27}H_{22}$

**1-Benzhydryl-9,10-dihydroanthracene**



M. P., °C
131–132[14]

**9-Benzhydryl-9,10-dihydroanthracene**



M. P., °C
207.5[13]

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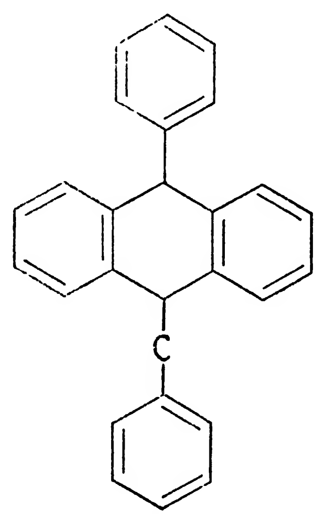
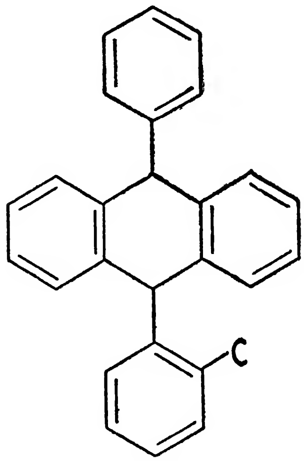
**9-Phenyl-10-benzyl-9,10-dihydroanthracene**



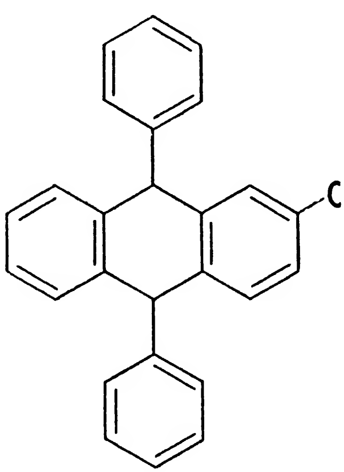
M. P., °C
119[13]

**9-Phenyl-10-*o*-tolyl-9,10-dihydroanthracene**



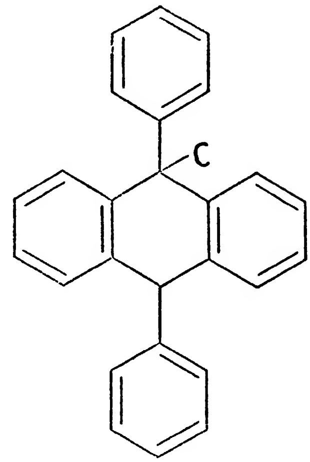
M. P., °C
186–187[7]

**2-Methyl-9,10-diphenyl-9,10-dihydroanthracene**



M. P., °C
179[6]

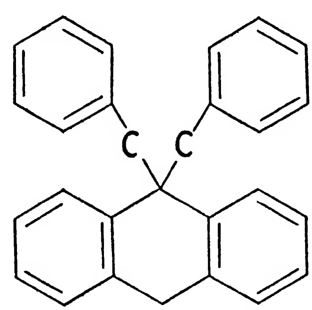
**9-Methyl-9,10-diphenyl-9,10-dihydroanthracene**



M. P., °C
171[13]

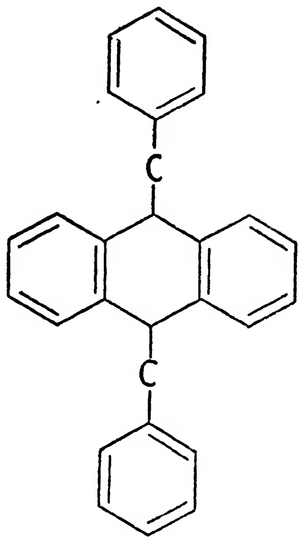
$C_{28}H_{24}$

**9,9-Dibenzyl-9,10-dihydroanthracene**



M. P., °C
178[3]
115[9]

**9,10-Dibenzyl-9,10-dihydroanthracene**



M. P., °C
118[3]

**x,x-Dimethyl-9,10-diphenyl-9,10-dihydroanthracene** (a)

M. P., °C
185[12]

(a) The structure of this compound was not clearly defined in the literature.

$C_{30}H_{28}$

**x,x-Dimethyl-9,10-dibenzyl-9,10-dihydroanthracene** (a)

M. P., °C
215[12]

(a) The structure of this compound was not clearly defined in the literature.

*References on Dihydroanthracenes and Dihydrophenanthrenes with Two Phenyl Substitutions*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## 4. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-32}$

$C_{22}H_{12}$

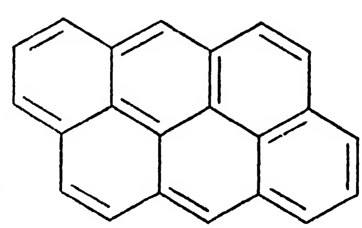
**Dinaphthylanthrylene** (a)

M. P., °C
270[23]

(a) This name was given in the literature with the formula:

$$\begin{array}{l} C_{10}H_6—C \\ | \qquad\quad ||| \\ C_{10}H_6—C \end{array}$$

**Dibenzo-[cd,jk]-pyrene**
(Anthranthrene)



M. P., °C
261[8, 9]
258[14]
257[29]

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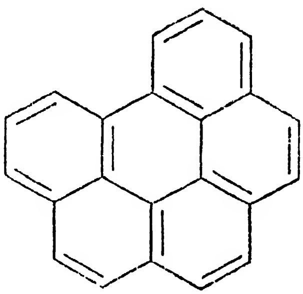
**Benzo-[ghi]-perylene**

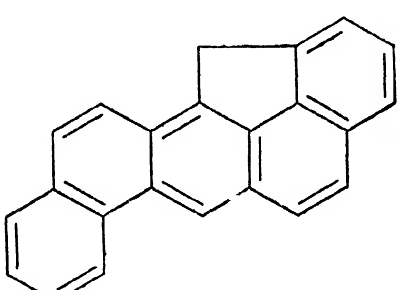


M. P., °C
278–281[12]
277–278.5[12]
273[5, 7]
272[35]

---

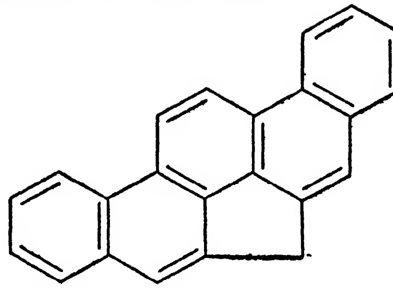
## $C_{23}H_{14}$

**Benzo-[bc]-cholanthrene**



M. P., °C
266–267[21]

**Cyclopentano-[ghi]-picene**



M. P., °C
277[31]

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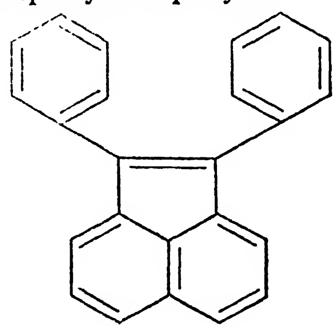
## $C_{24}H_{16}$

**1,2-Diphenylacenaphthylene**



M. P., °C
164.5–166[24]
161–162[32]
161.3[2]
159.5–161[33]

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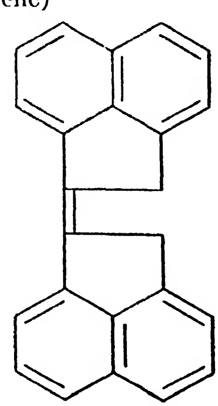
**1,1′-Biacenaphthylidene**
(Biacene)



M. P., °C
277[15, 16]
275–276[17]
271–273[18]

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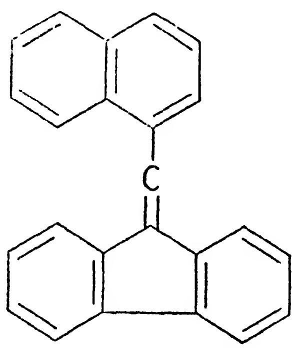
**(1-Naphthyl)-(9′-fluorylidene)-methane**



M. P., °C
149–150[28]

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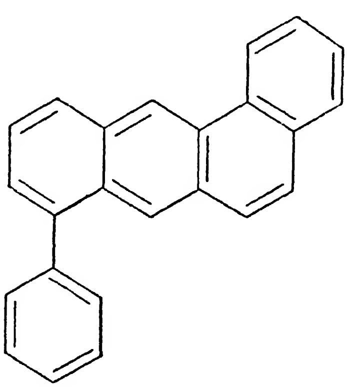
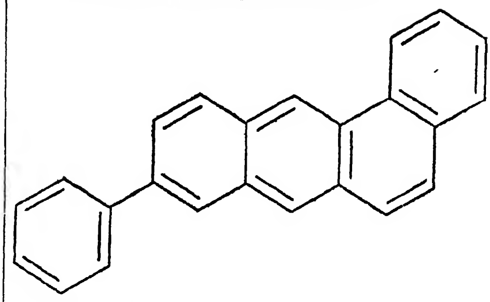
**1,2-Benzo-5-phenylanthracene**



M. P., °C
151–152[1]

**1,2-Benzo-6-phenylanthracene**



M. P., °C
240–241[10]

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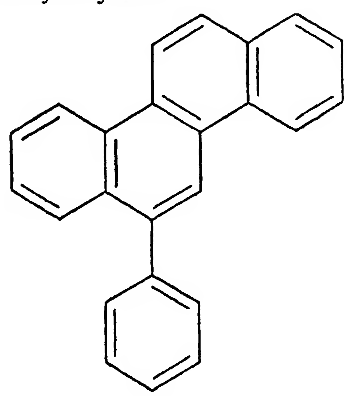
**6-Phenylchrysene**



M. P., °C
192-192.5[30]

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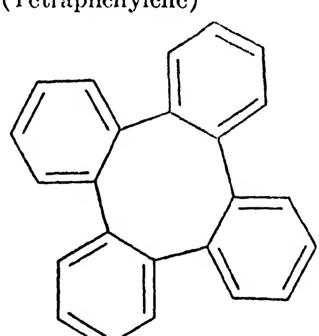
**1,2,3,4,5,6,7,8-Tetrabenzocyclo-octane**
(Tetraphenylene)



M. P., °C
233[26]

**Tetraphenylene** (a)

M. P., °C

304–305[6]

(a) The structure of this compound was not clearly defined in the literature.

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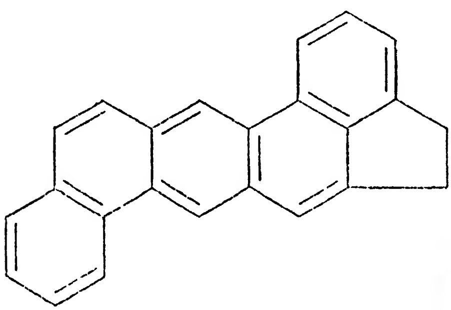
**Indo-[3,4-ab]-benzo-[h]-anthracene**



M. P., °C

231–233[11]

---

**x,x-Dihydro-x,x-dibenzopyrene** (a)

M. P., °C

313.5–314.5[31]

(a) The structure of this compound was not clearly defined in the literature.

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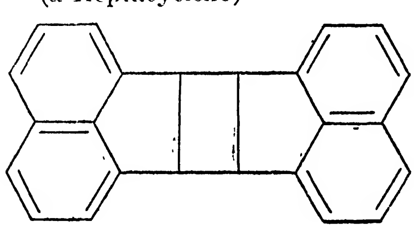
**1,2,3,4-Di-(2′,1′-acenaphtheno)-cyclobutane**

(α-Heptacyclene)



M. P., °C

306–307[19, 20]

**β-Heptacyclene** (a)

M. P., °C

234[20]

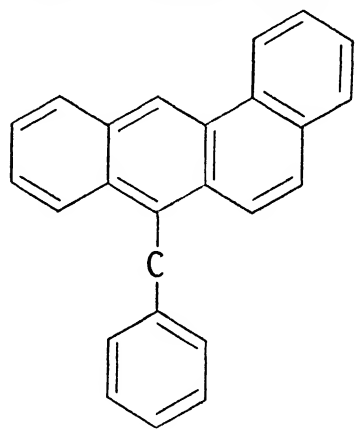
232–234[19]

(a) The structure of this compound was not clearly defined in the literature.

---

$C_{25}H_{18}$

**1,2-Benzo-10-benzylanthracene**




M. P., °C

195–196[10]

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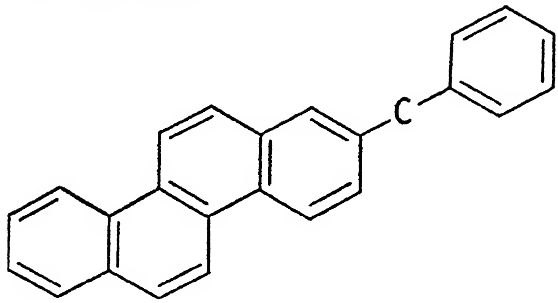
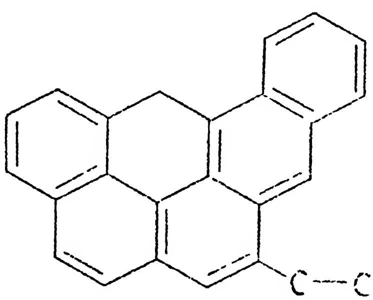
*This series continued on next page*

**2-Benzylchrysene**




M. P., °C
200[22]

**Dibenzo-[a, jk]-4-ethyl-10-hydropyrene** (a)

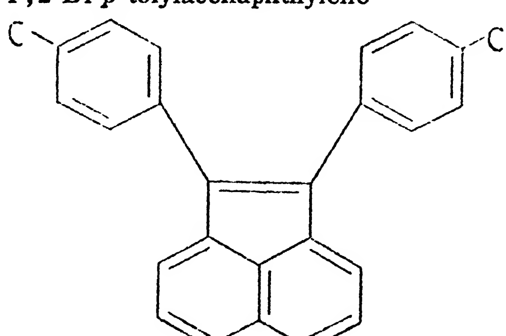



M. P., °C
116.5–117.5[13]

(a) The structure of this compound was not clearly defined in the literature.

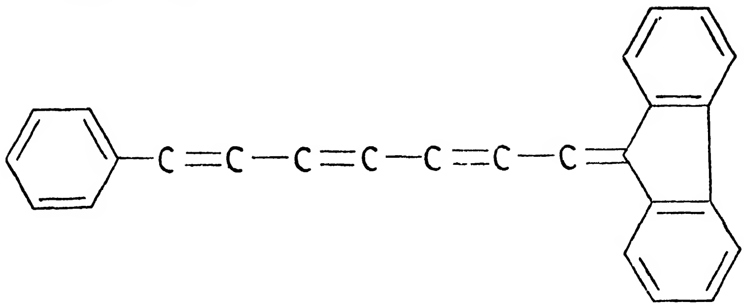
$C_{26}H_{20}$

**1, 2-Di-*p*-tolylacenaphthylene**




M. P., °C

**1-Phenyl-7-(9′-fluorylidene)-heptatriene-1,3,5**



M. P., °C
166[25]

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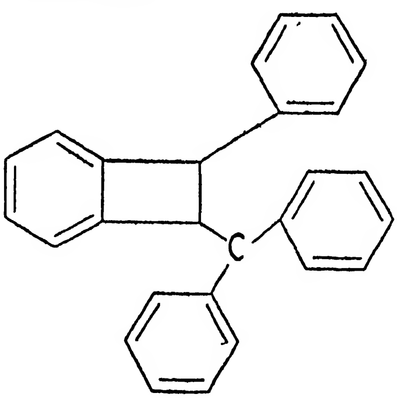
$C_{27}H_{22}$

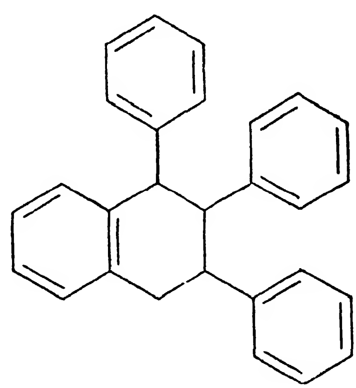
**1-Phenyl-2-benzhydryl-3,4-benzocyclobutane**



M. P., °C
184[27]

$C_{28}H_{24}$

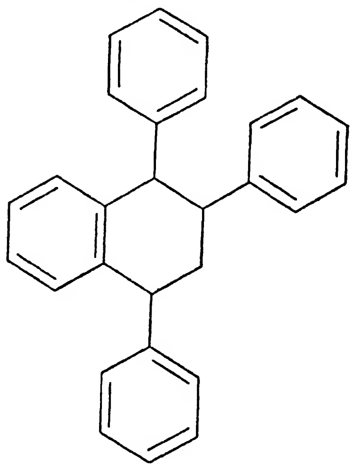
**1,2,3-Triphenyl-1,2,3,4-tetrahydronaphthalene**



M. P., °C
136–137[3]

*This series continued on next page*

## 1,2,4-Triphenyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
127[4]

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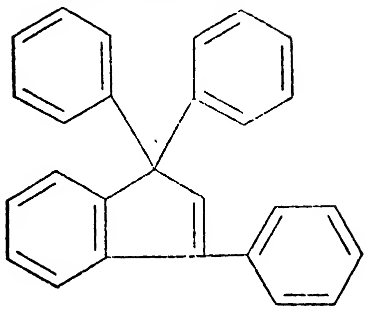
## XV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-34}$

1. Indene with Three Phenyl Substitutions
2. Anthracene or Phenanthrene with Two Phenyl Substitutions
3. Miscellaneous Polynuclear Aromatics of Empirical Formula $C_nH_{2n-34}$

## 1. INDENE WITH THREE PHENYL SUBSTITUTIONS, $C_nH_{2n-34}$

$C_{27}H_{20}$

**1,1,3-Triphenylindene**



M. P., °C

135[12,16]

134–135[15]

132–134[2,9]

133[17]

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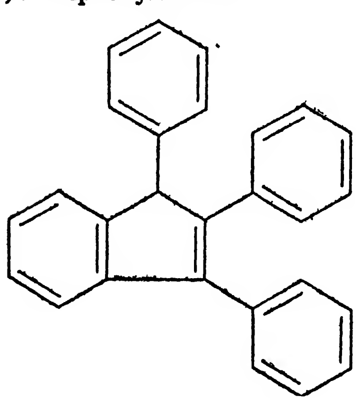
**1,2,3-Triphenylindene**



M. P., °C

135[12,18,17]

132–134[6]

130–132[9]

$D_4^{20}$

1.176 0°[18]

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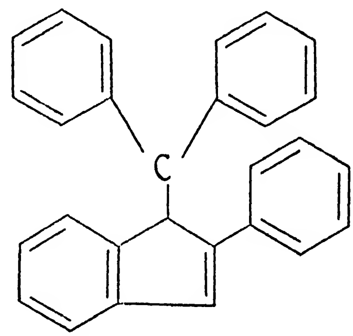
$C_{28}H_{22}$

**1-Benzhydryl-2-phenylindene**



M. P., °C

175[4]

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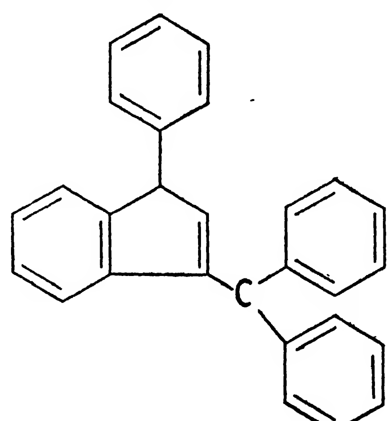
**1-Phenyl-3-benzhydrylindene**

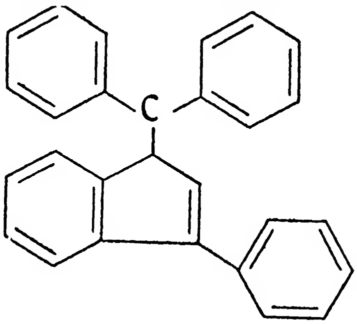


M. P., °C

131[15]

124–125[4]

**1-Benzhydryl-3-phenylindene**



M. P., °C
174.5–175[4]
171[15]

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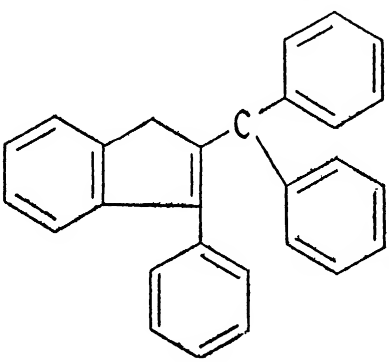
**2-Benzhydryl-3-phenylindene**



M. P., °C
162–163.5[10]

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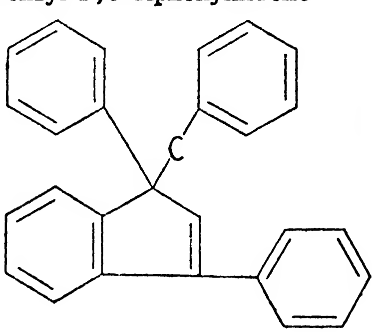
**1-Benzyl-1,3-diphenylindene**



M. P., °C
100–102[8]

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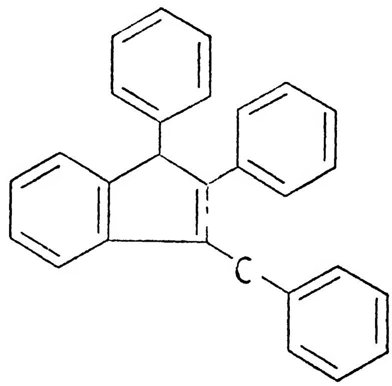
**1,2-Diphenyl-3-benzylindene**



M. P., °C
143–144[1]
118.5–119.5[6]

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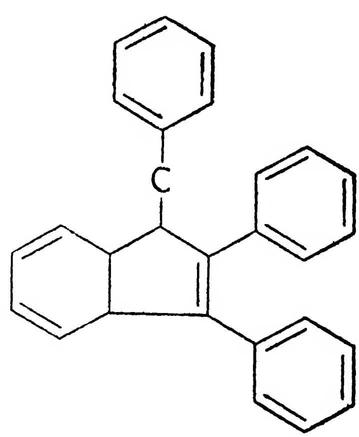
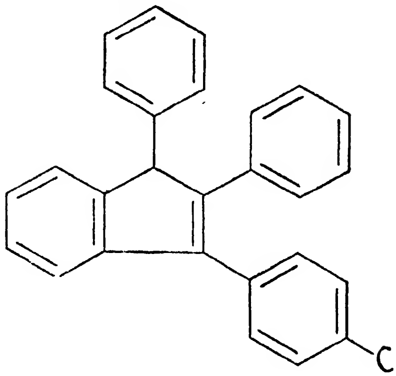
**1-Benzyl-2,3-diphenylindene**



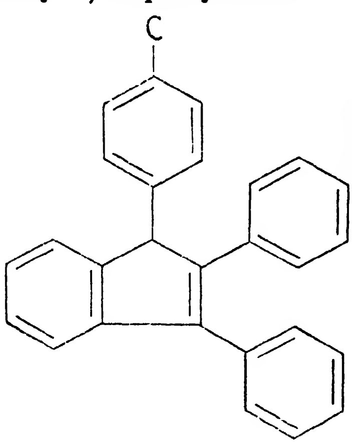
M. P., °C
118.5–120[6]

**1,2-Diphenyl-3-*p*-tolylindene**



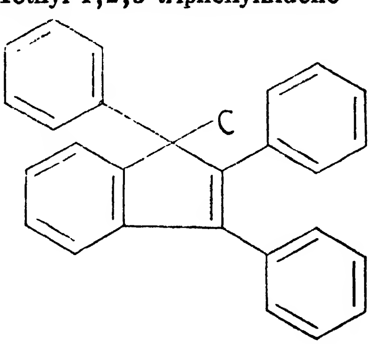
M. P., °C
116–117[7]

**1-*p*-Tolyl-2,3-diphenylindene**



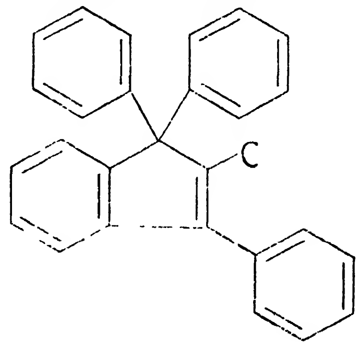
M. P., °C
154–156[7]

**1-Methyl-1,2,3-triphenylindene**



M. P., °C
96–98[11]

**1,1,3-Triphenyl-2-methylindene**



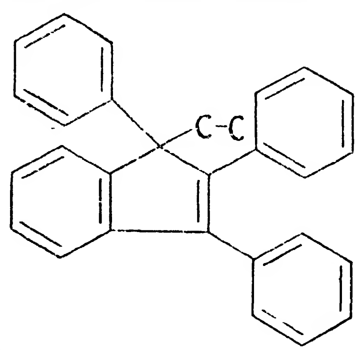
M. P., °C
157–159.5[11]
150[3]

**x-Methyl-x,x,x-triphenylindene** (a)
M. P., °C
118[14]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{29}H_{24}$

**1-Ethyl-1,2,3-triphenylindene**



M. P., °C
108[12]

*References on Indene with Three Phenyl Substitutions*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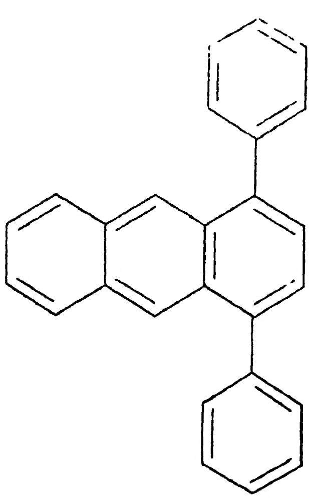
## 2. ANTHRACENE OR PHENANTHRENE WITH TWO PHENYL SUBSTITUTIONS, $C_nH_{2n-34}$

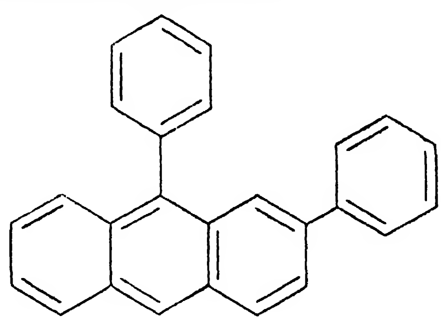
$C_{26}H_{18}$

**1,4-Diphenylanthracene**



M. P., °C
170[39]

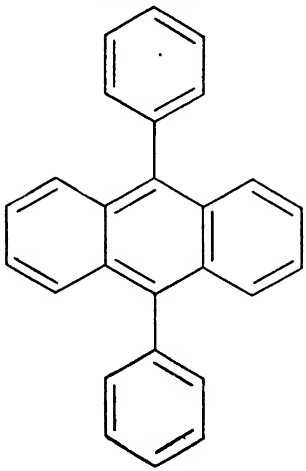
**2,9-Diphenylanthracene**



M. P., °C
165–166[25]

*This series continued on next page.*

**9,10-Diphenylanthracene**



M. P., °C

247
250–251[19]
249–250[23, 26]
248[17]
247–248[16, 23]
247[25, 34]
246[38]
245–246[29]
242–243[28]
241–243[11]
214 (a)[34]

(a) This constant was determined on an isomeric form of the compound.

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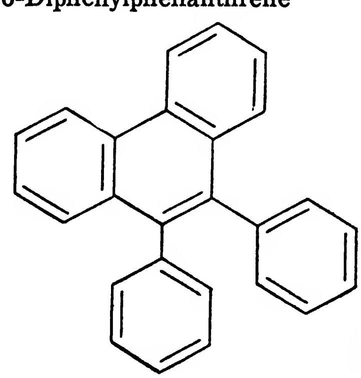
**9,10-Diphenylphenanthrene**



M. P., °C

236
240[35]
237[18, 30]
235–235.5[14]
235[36]
234[12, 15]
233–234[40]

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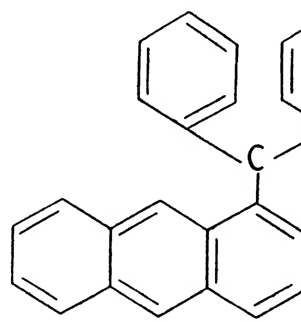
$C_{27}H_{20}$

**1-Benzhydrylanthracene**



M. P., °C

173–175[37]

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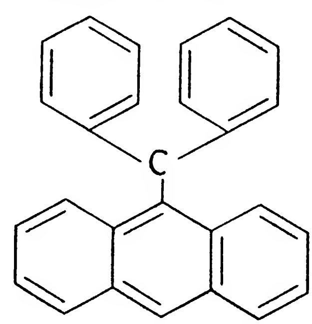
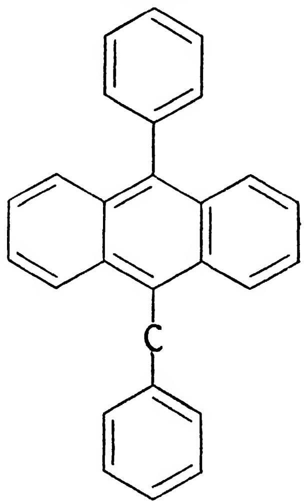
**9-Benzhydrylanthracene**



M. P., °C

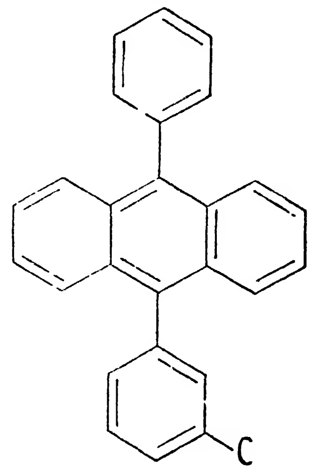
204–205[4]

### 9-Phenyl-10-benzylanthracene



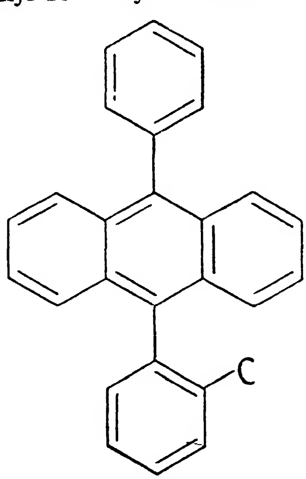
M. P., °C
155[7]
154[27]
151[34]

### 9-Phenyl-10-*m*-tolylanthracene



M. P., °C
182–183[34]

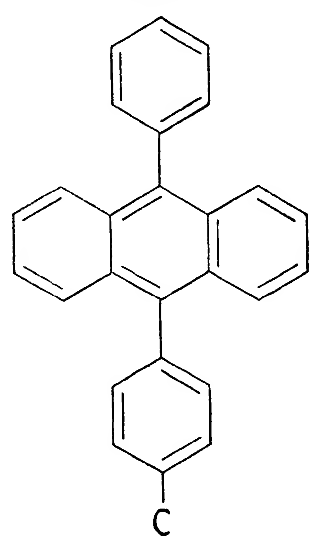
### 9-Phenyl-10-*o*-tolylanthracene



M. P., °C
261–262[23]
257–258[34]
172–173 (a)[34]

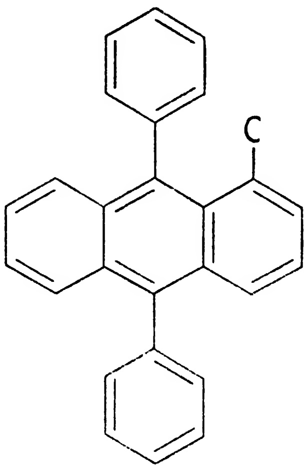
(a) This constant was determined on an isomeric form of the compound.

### 9-Phenyl-10-*p*-tolylanthracene



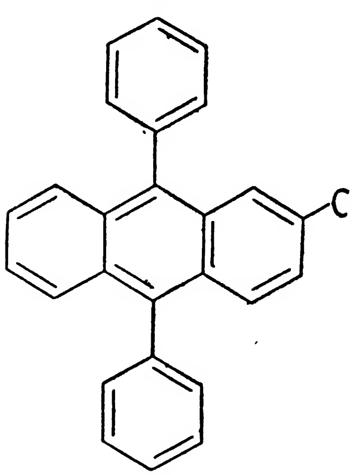
M. P., °C
192[22]

**1-Methyl-9,10-diphenylanthracene**



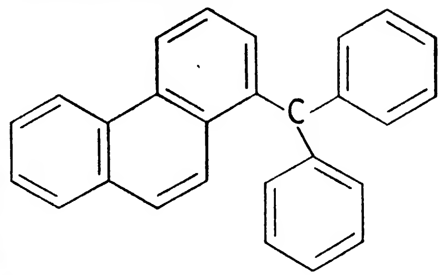
M. P., °C
194[34]

**2-Methyl-9,10-diphenylanthracene**



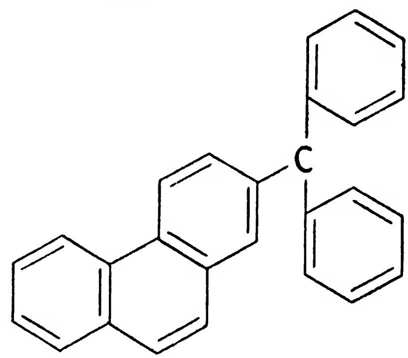
M. P., °C
242–243[20]
214[34]
213[21]

**1-Benzhydrylphenanthrene**



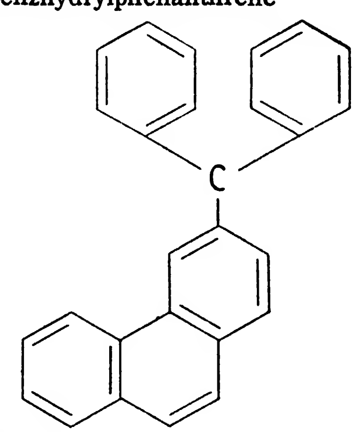
M. P., °C
175–176[3]

**2-Benzhydrylphenanthrene**



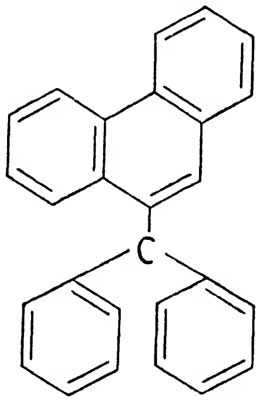
M. P., °C
151–152[3]

**3-Benzhydrylphenanthrene**



M. P., °C
122–123[3]

9-Benzhydrylphenanthrene



M. P., °C
175–176[1]
174–175[3]

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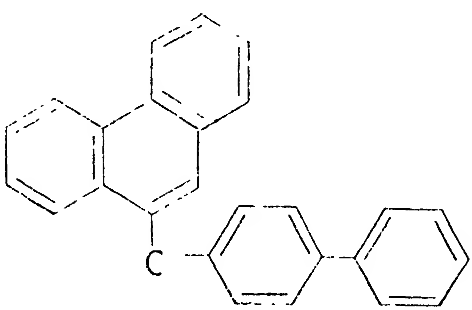
*p*-Biphenylyl-9-phenanthrylmethane



M. P., °C
192–193[3]

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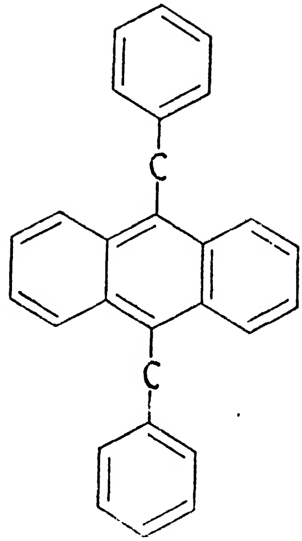
$C_{28}H_{22}$

9,10-Dibenzylanthracene



M. P., °C
242
245[6]
243–245[2]
241–242[13]
241[31]
240[13]
239–240[31, 32]

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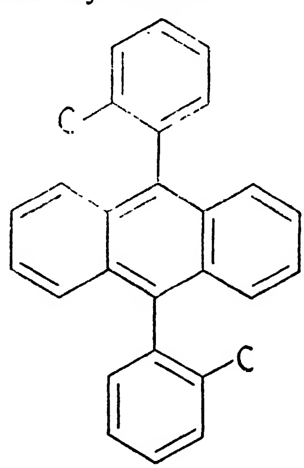
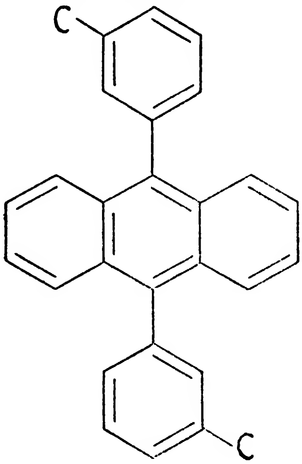
9,10-Di-*o*-tolylanthracene



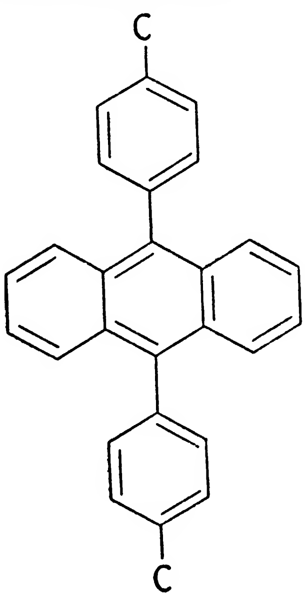
M. P., °C
347–348[41]

**9,10-Di-*m*-tolylanthracene**



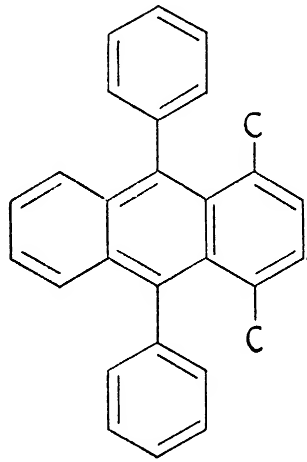
M. P., °C
222[41]

**9,10-Di-*p*-tolylanthracene**



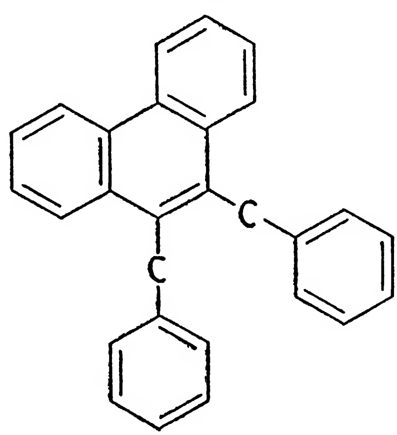
M. P., °C
279[41]
278–279[26]

**1,4-Dimethyl-9,10-diphenylanthracene**



M. P., °C
189[9]

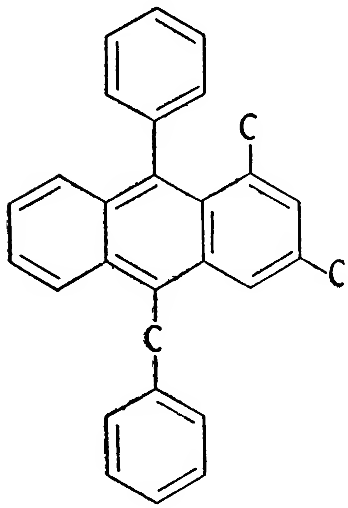
**9,10-Dibenzylphenanthrene**



M. P., °C
180–182[42]

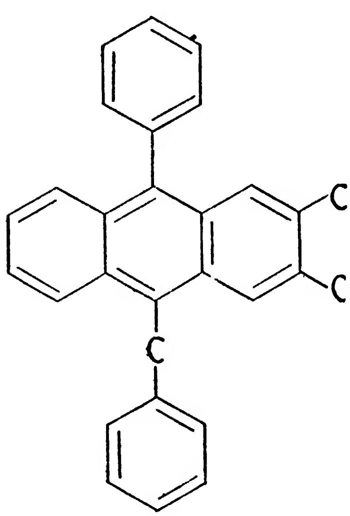
$C_{29}H_{24}$

**1,3-Dimethyl-9-phenyl-10-benzylanthracene**



M. P., °C
137[8]

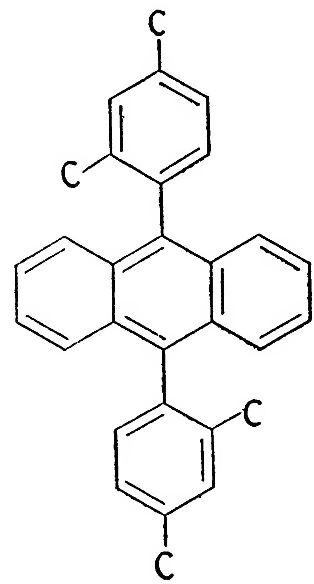
**2,3-Dimethyl-9-phenyl-10-benzylanthracene**



M. P., °C
163[10]

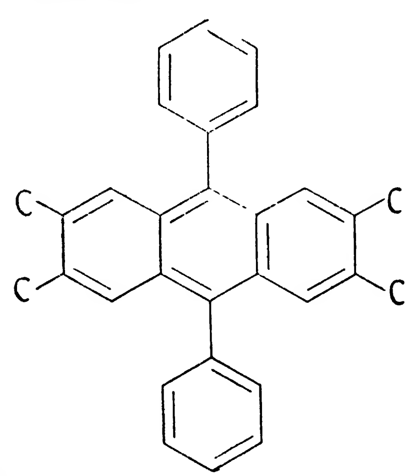
$C_{30}H_{26}$

**9,10-Di-(2′,4′-dimethylphenyl)-anthracene**



M. P., °C
290[17]

**2,3,6,7-Tetramethyl-9,10-diphenylanthracene**



M. P., °C
312[5]
284–285[33]

**1-Methyl-7-isopropyl-x,x-diphenyl-phenanthrene** (a)

M. P., °C

200[24]

(a) The structure of this compound was not clearly defined in the literature.

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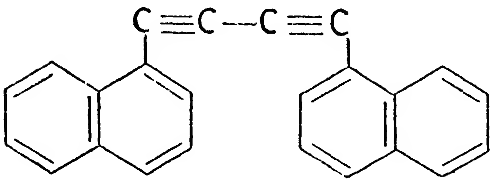
## 3. MISCELLANEOUS POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-34}$

### $C_{24}H_{14}$

**Di-(1-naphthyl)-butadiyne**




M. P., °C
171[33]

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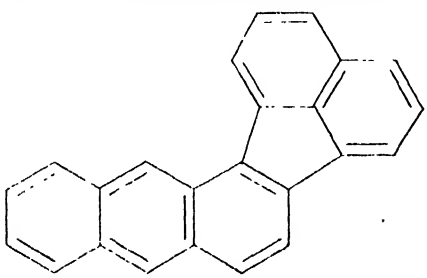
**1,2-(2′,1′-Acenaphtho)-anthracene**



M. P., °C
290–291[63]

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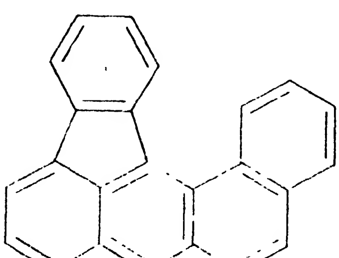
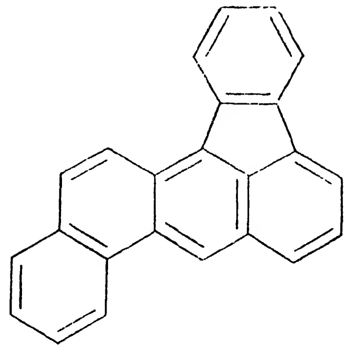
**Benzo-[a]-indo-[3,2,1-kl]-anthracene**



M. P., °C
178–179[29]

**1,2-Benzocholanthrylene**



M. P., °C
181–181.3[29]
180.2–180.6[76]

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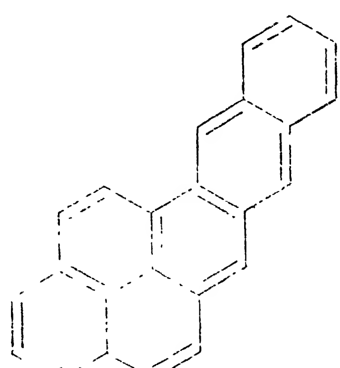
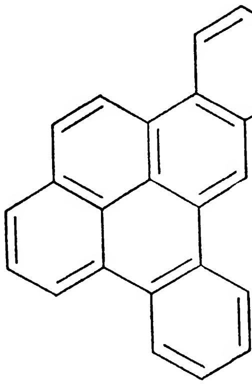
**1,2-(3′,2′-Naphtho)-pyrene**



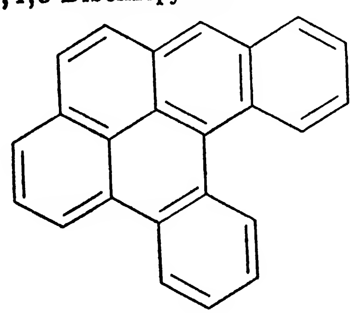
M. P., °C
273[25]
265–266[17]

**1,2,4,5-Dibenzopyrene**



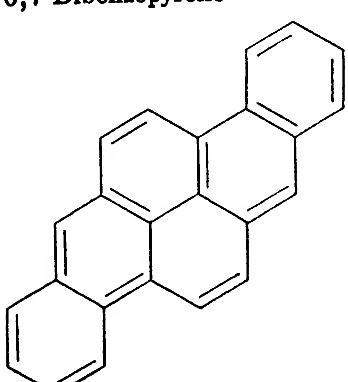
M. P., °C
238–239[31]
225[21]

**2,3,4,5-Dibenzopyrene**



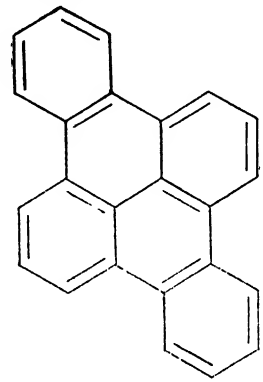
M. P., °C
226–227[16]

**1,2,6,7-Dibenzopyrene**



M. P., °C
315[66]
308[18]

**4,5,9,10-Dibenzopyrene**

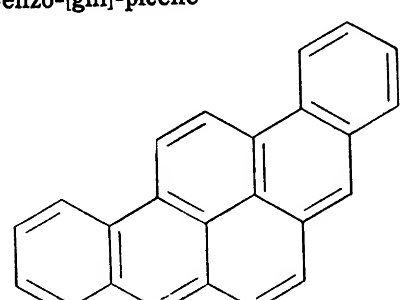


M. P., °C
353–355[54]
340–342[21]

**x,x,-Dibenzopyrene** (a)
M. P., °C
320–320.5[77]

(a) The structure of this compound was not clearly defined in the literature.

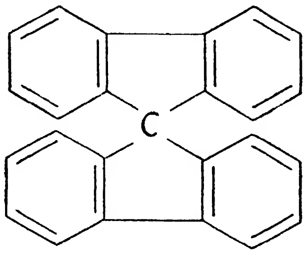
**Benzo-[ghi]-picene**



M. P., °C
281.5–282[58]
280[18]

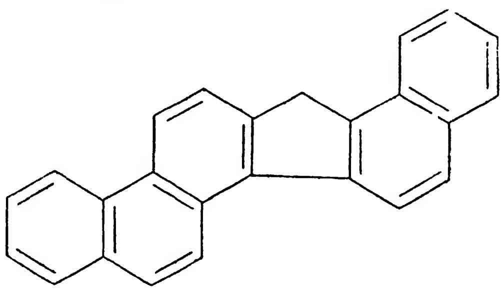
$C_{25}H_{16}$

Spiro[fluorene-9,9′-fluorene]



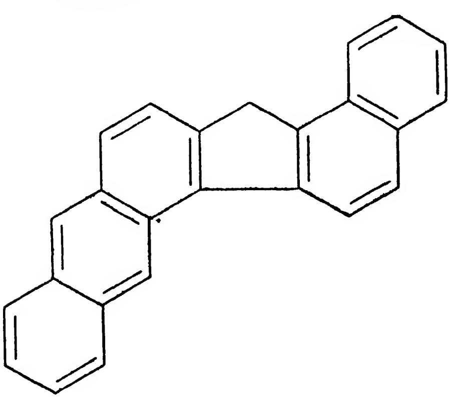
M. P., °C
198–199[22]

1,2-Benzo-5,6-(2′,1′-naphtho)-fluorene



M. P., °C
286–287[14]

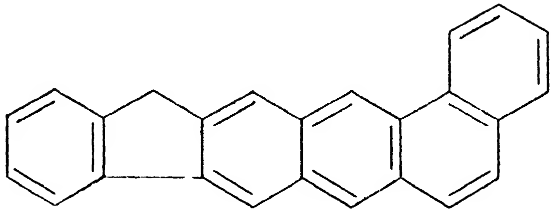
1,2-Benzo-5,6-(3′,2′-naphtho)-fluorene



M. P., °C
225[14]

*This series continued on next page*

**1,2-Benzo-6,7-(3',2'-indo)-anthracene**



M. P., °C
302–304[24]

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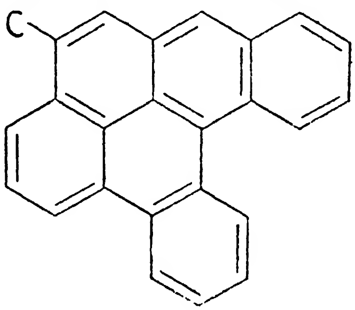
**9-Methyl-2,3,4,5-dibenzopyrene**



M. P., °C
225–226[15]

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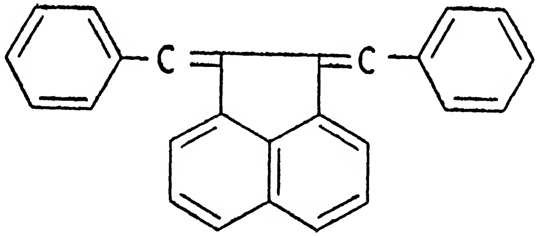
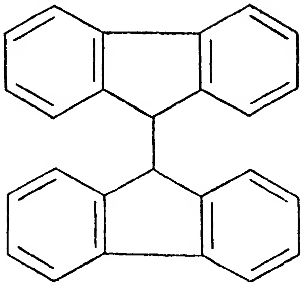
$C_{26}H_{18}$

**1,2-Dibenzylideneacenaphthene**



M. P., °C
142[46]

**9,9′-Bifluoryl**



M. P., °C

**246.5**
219[44]
246–247[43, 69, 70]
246[6, 28, 30]
215[51]
244–245[49, 74]
242–244[35]
241[47, 61]
240[39, 55, 59]

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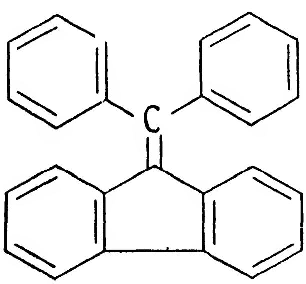
**9-Benzhydrylidenefluorene**

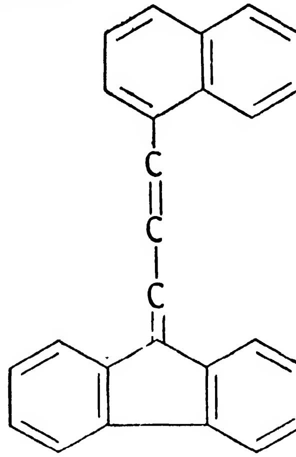


M. P., °C

**229**
229.5[37, 38, 40]
229–229.5[63]
228[60]
225[32]
224–225[55]
223.5–224.5[76]
213 (a)[55]

(a) This constant was determined on a stereoisomer of the compound.

**1-(1′-Naphthyl)-3-(9″-fluorylidene)-propene-1**



M. P., °C

174–175[56]

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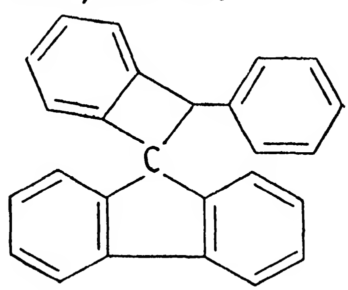
**Spiro[2-phenyl-3,4-benzocyclobutane-1,9′-fluorene]**



M. P., °C

235[41]

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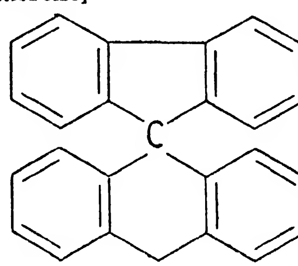
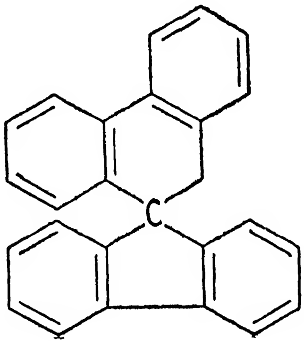
**Spiro[9,10-dihydroanthracene-9,9′-fluorene]**



M. P., °C

207[22]

**Spiro[9,10-dihydrophenanthrene-9,9′-fluorene]**



M. P., °C
195[62]

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**x,x-Dihydrohexacene** (a)
M. P., °C
369–370[45]
357–358[19]

(a) The hydrogens are in either the 5, 16- or the 6, 15-positions.

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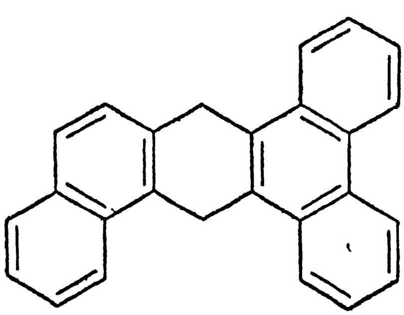
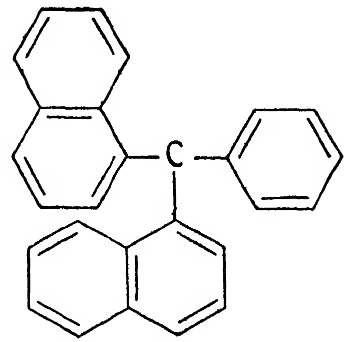
**1,2,3,4,5,6-Tribenzo-9,10-dihydroanthracene**



M. P., °C
281–283[1]

## $C_{27}H_{20}$

**Phenyldi-(1′-naphthyl)-methane**



M. P., °C
288[36]
204[57]

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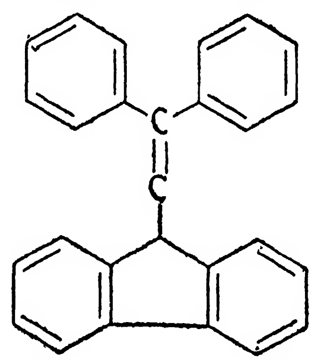
**9-Fluorylbenzhydrylidenemethane**



M. P., °C
111–112[55]

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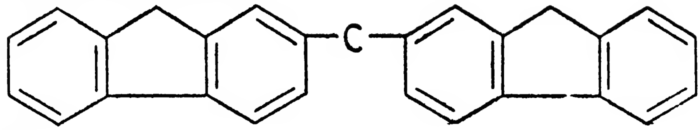
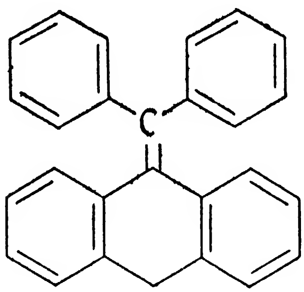
*This series continued on next page*

**2,2′-Difluorylmethane**



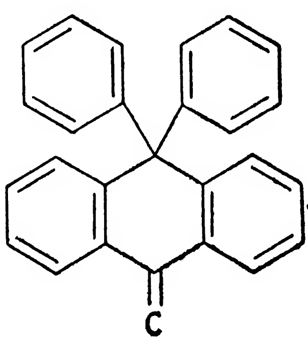
M. P., °C
201–202[27]

**9-Benzhydrylidene-9,10-dihydroanthracene**



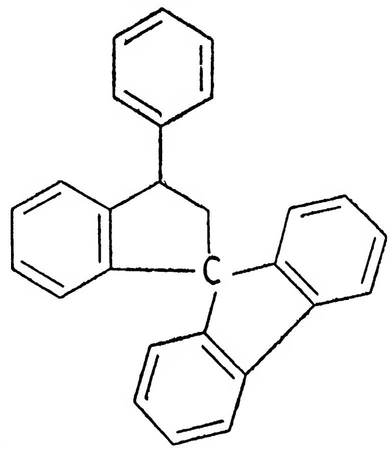
M. P., °C
256[50]

**9,9-Diphenyl-10-methylene-9,10-dihydroanthracene**



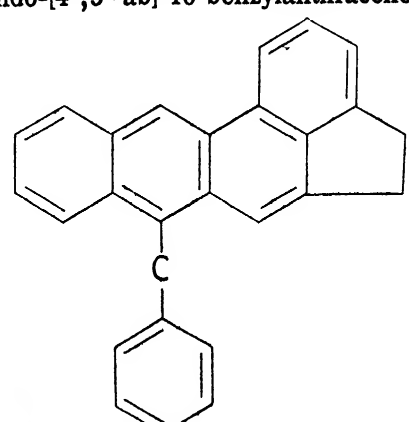
M. P., °C
192[2]
187[5]

**Spiro[3-phenylindane-1,9′-fluorene]**



M. P., °C
125–127[42]

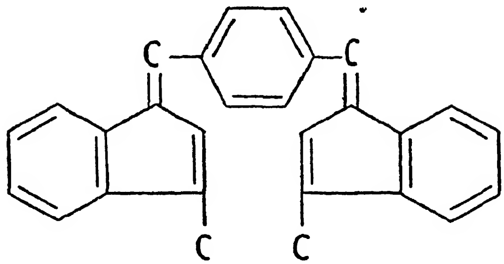
**Indo-[4′,3′-ab]-10-benzylanthracene**



M. P., °C
199–200[23]

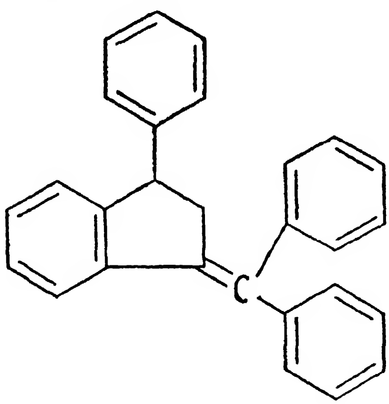
## $C_{28}H_{22}$

### 1,4-Di-(3′-methylindenylidene-methyl)-benzene



M. P., °C
224[48]

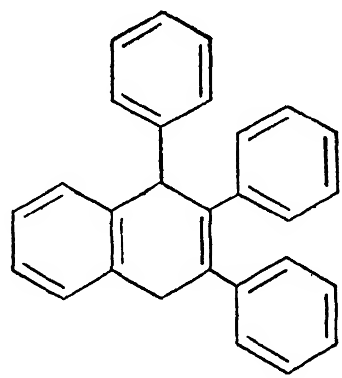
### 1-Phenyl-3-benzhydrylideneindane



M. P., °C
130-131.5 (a)[11]
130–131 (a)[11]
115–117 (a)[11]
115 (a)[11]
115[71]

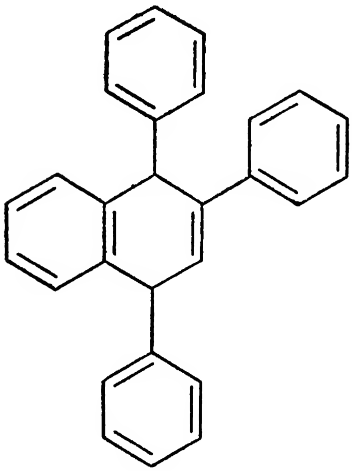
(a) These constants were determined on isomeric forms.

### 1,2,3-Triphenyl-1,4-dihydronaphthalene



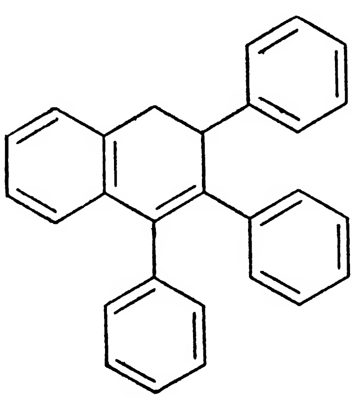
M. P., °C
165[8]

**1,2,4-Triphenyl-1,4-dihydronaphthalene**



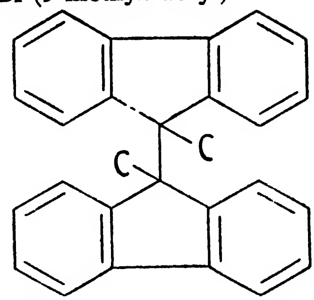
M. P., °C
142.5-144[10]

**2,3,4-Triphenyl-1,2-dihydronaphthalene**



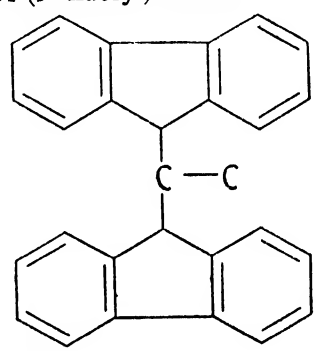
B. P., °C @ 760mm
215 0.5[9]

**9,9′-Bi-(9-methylfluoryl)**



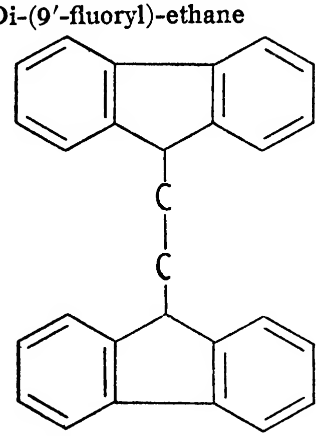
M. P., °C
209[64, 65]
206[72]

**1,1-Di-(9′-fluoryl)-ethane**



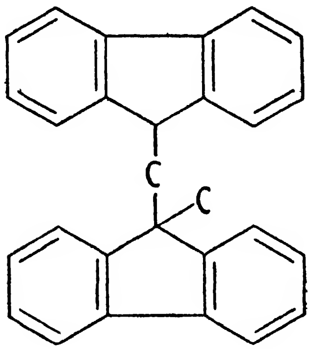
M. P., °C
262–263[52]

**1,2-Di-(9′-fluoryl)-ethane**



M. P., °C
224–225[72, 73]
218–219[7]

**9-Fluoryl-[9′-(9′-methylfluoryl)]-methane**



M. P., °C
171–171.5[72]

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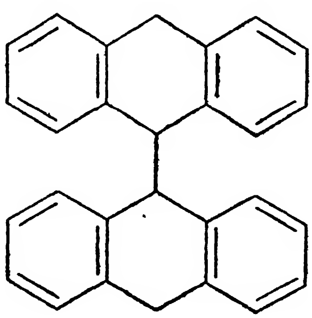
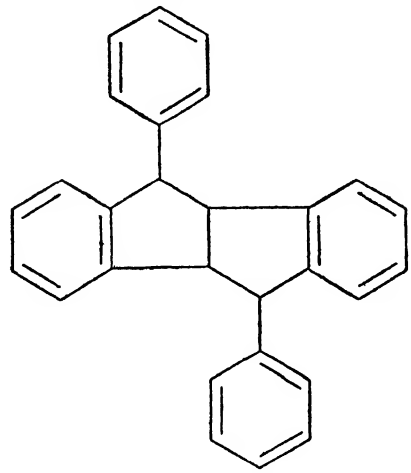
**Bi-9,9′-(9,10-dihydroanthryl)**



M. P., °C
255[55]
248–249[53]

**2,3,6,7-Dibenzo-4,8-diphenylbicyclo-[3,3,0]-octane**



M. P., °C
207–208 (a)[12]
166–167 (a)[12]

(a) These constants were determined on isomeric forms.

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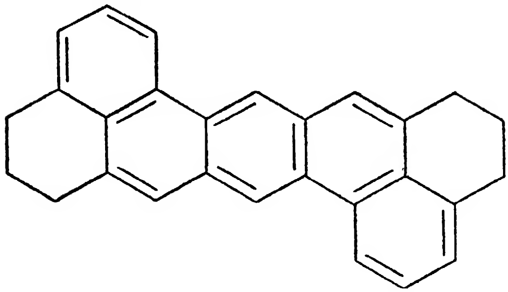
*This series continued on next page*

**Dibenzo-[de, op]-1,2,3,8,9,10-hexa-hydropentacene**



M. P., °C
255–256[20]

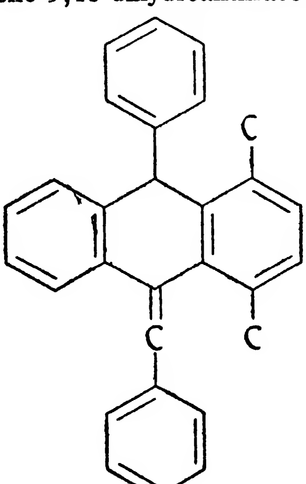
$C_{29}H_{24}$

**x-Benzyl-x-benzhydrylindene** (a)

M. P., °C
137–138 (b)[75]
130–131 (b)[75]

(a) The structure of this compound was not clearly defined in the literature.
(b) These constants probably represent two different compounds.

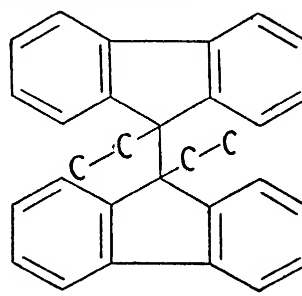
**1,4-Dimethyl-9-phenyl-10-benzylidene-9,10-dihydroanthracene**



M. P., °C
170[3]

$C_{30}H_{26}$

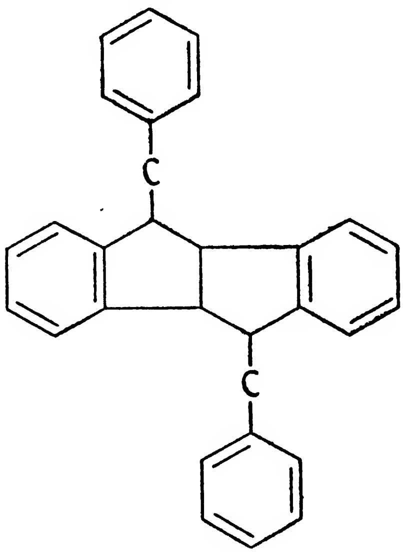
**9,9′-Bi-(9-ethylfluoryl)**



M. P., °C
210[64, 65]

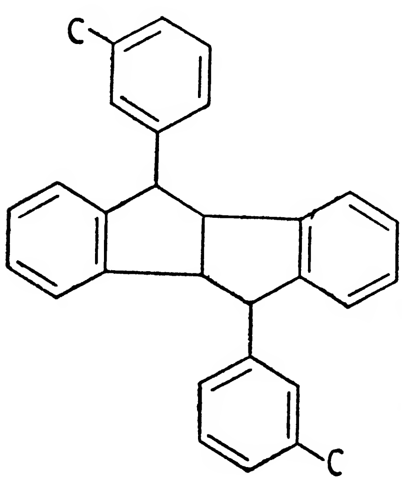
*This series continued on next page*

**2,3,6,7-Dibenzo-4,8-dibenzylbicyclo-[3,3,0]-octane**



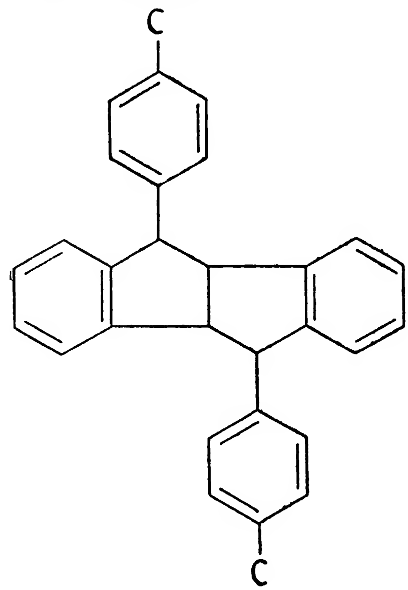
M. P., °C
141[13]

**2,3,6,7-Dibenzo-4,8-di-*m*-tolylbicyclo-[3,3,0]-octane**



M. P., °C
150[12]

**2,3,6,7-Dibenzo-4,8-di-*p*-tolylbicyclo-[3,3,0]-octane**

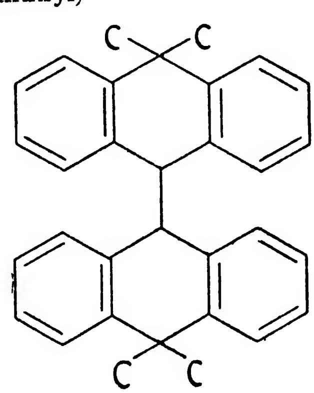


M. P., °C
188–189 (a)[12]
145–146 (a)[12]

(a) These constants were determined on isomeric forms.

## $C_{32}H_{30}$

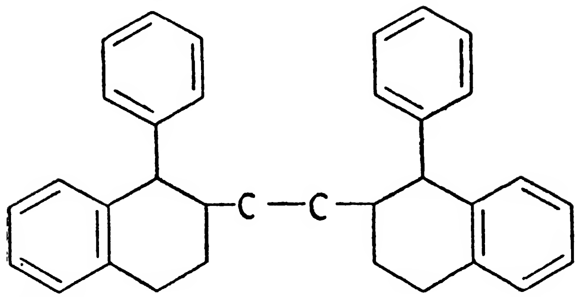
**9,9-Bi-(10,10-dimethyl-9,10-dihydroanthryl)**



M. P., °C
315[4]

## $C_{34}H_{34}$

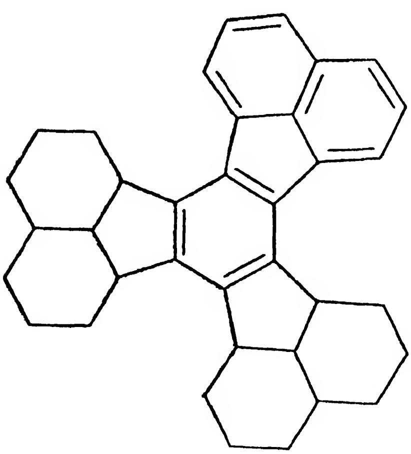
### 1,2-Di-[2′-(1′-phenyl-1′,2′,3′,4′-tetrahydronaphthyl)]-ethane



M. P., °C
169.5–170.5[34]

## $C_{36}H_{38}$

### 1,2-(2′,1′-Acenaphtho)-3,4,5,6-di-[2″,1″-(2a″,3″,4″,5″,5a″,6″,7″,8″,8a″,8b″-decahydroacenaphtho)]-benzene



M. P., °C
245[67]

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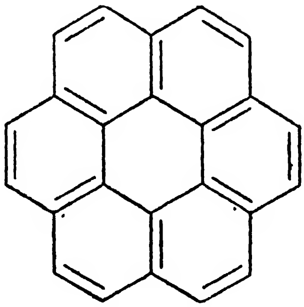
# XVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-36}$

## XVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-36}$

### $C_{24}H_{12}$

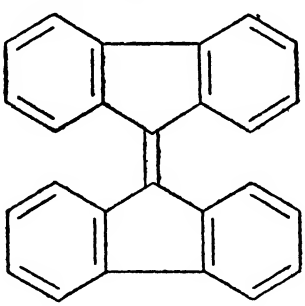
**Coronene**



M. P., °C
435[35]
429–430[68]

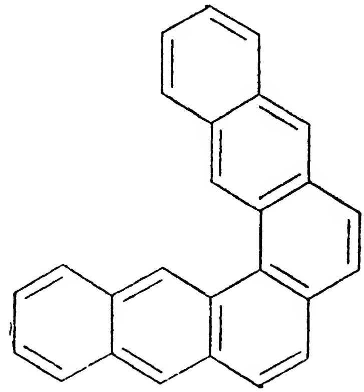
### $C_{26}H_{16}$

**9,9′-Bifluorylidene**



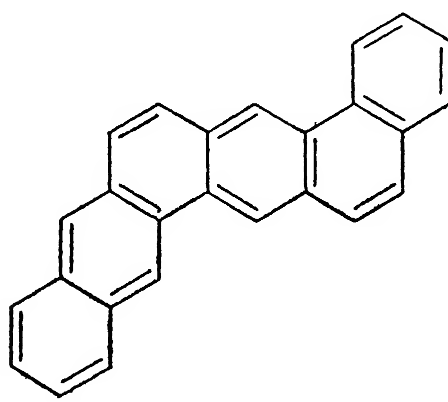
M. P., °C
**187.5**
189–190[27, 40, 44]
189[50, 53]
187–189[43]
188[39, 77]
187–188[38, 72]
187[42, 70, 76, 84]
186–187[66]
185[69]
184[41, 63]

**1,2-(4′,3′-Anthro)-anthracene**



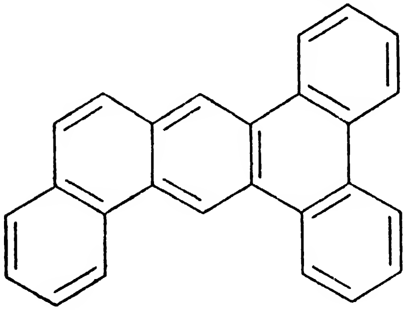
M. P., °C
308[24]
304[26]

**1,2-Benzo-5,6-(3′,2′-naphtho)-anthracene**



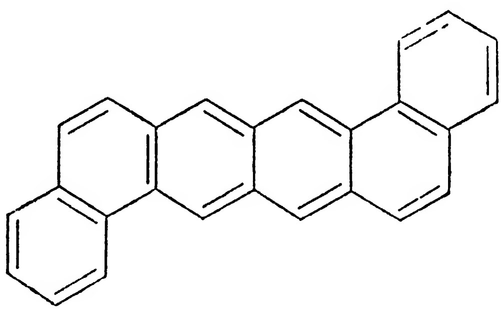
M. P., °C
281–282[25]
281[82]

**1,2,3,4,5,6-Tribenzoanthracene**



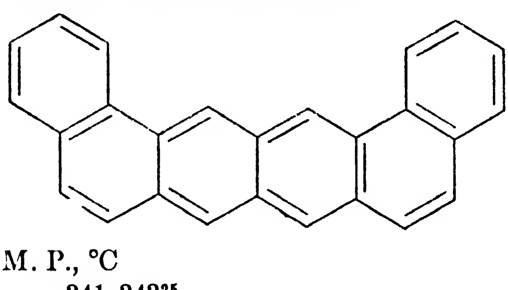
M. P., °C
224[34]
223[26]

**1,2,7,8-Dibenzonaphthacene**



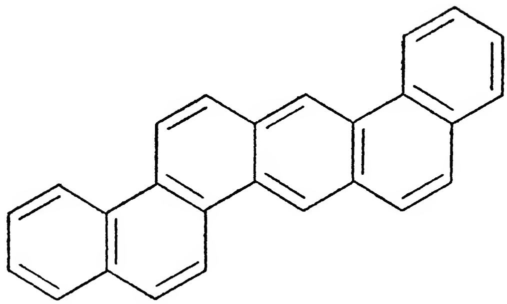
M. P., °C
345[28]

**1,2,9,10-Dibenzonaphthacene**



M. P., °C
341–343[25]

**2,3-(4′,3′-Naphtho)-chrysene**
(3,4,8,9-Dibenztetraphene)



M. P., °C
385[23]

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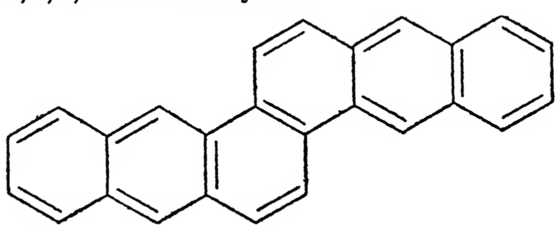
**2,3,8,9-Dibenzochrysene**



M. P., °C
389[26]

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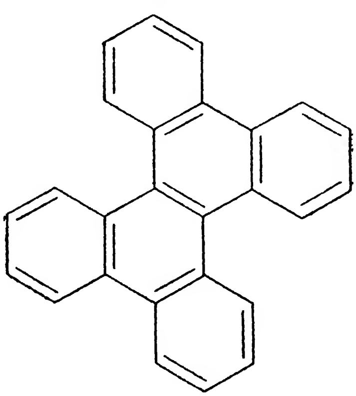
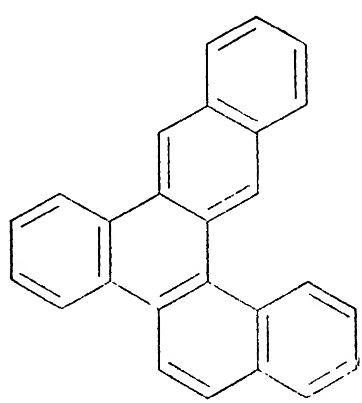
**5,6,11,12-Dibenzochrysene**



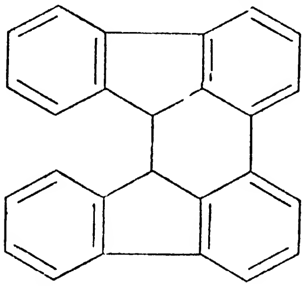
M. P., °C
218[76]
215[8]

**2,3,5,6-Dibenzotriphenylene**



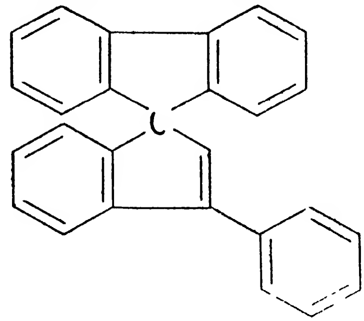
M. P., °C
185–186[13]

**Difluoro-[1,9-ab,8′,9′-de]-cyclohexane**
(1,9,8′,9′-Bifluorylene)



M. P., °C
218[31, 33]

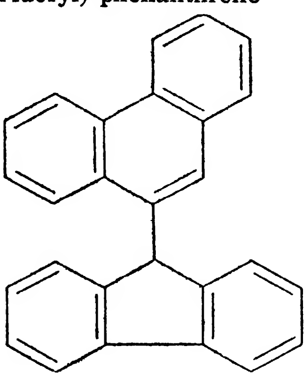
**Spiro[3-phenylindene-1,9′-fluorene]**



M. P., °C
194–197[47]
140–141[45]

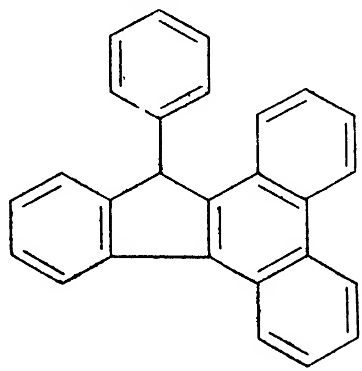
## $C_{27}H_{18}$

**9-(9′-Fluoryl)-phenanthrene**



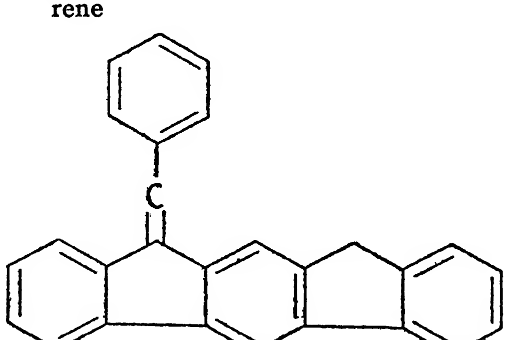
M. P., °C
196–197[1]

**1,2,3,4-Dibenzo-9-phenylfluorene**



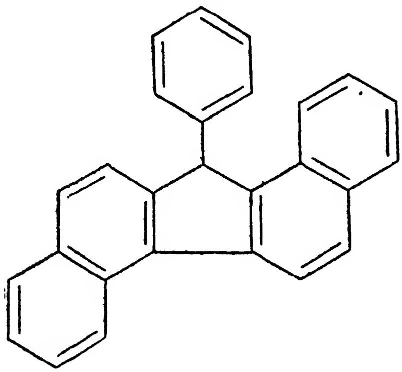
M. P., °C
210–211[1, 46]
209[48]

**2,3-(2′,3′-Indo)-9-benzylidenefluorene**



M. P., °C
107[57]

**1,2,5,6-Dibenzo-9-phenylfluorene**



M. P., °C
219–219.5[12]

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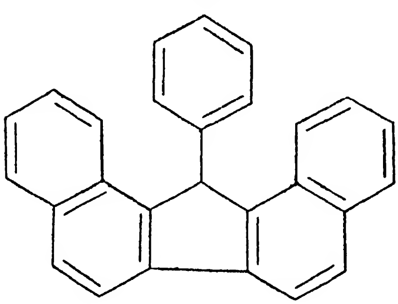
**1,2,7,8-Dibenzo-9-phenylfluorene**



M. P., °C
273[67]
148.5–149.5[12]

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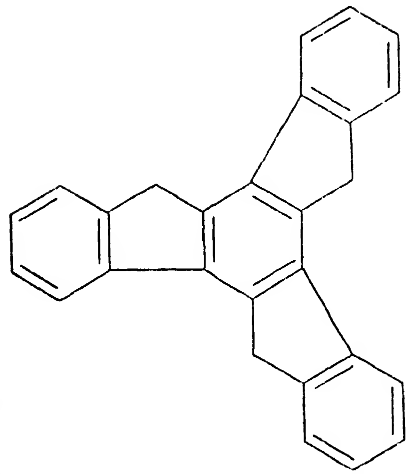
**1,2,3,4,5,6-Tri-(3′,2′-indo)-benzene**
(Truxene) (a)



M. P., °C
391[71]
369–370[74]
368[2]
365[78]
364-365[30]
330[73]

(a) This compound was thought by some investigators to be 2,3,2′,3′-Biindenylene or 2,3,3′,2′-Bi-indenylene.

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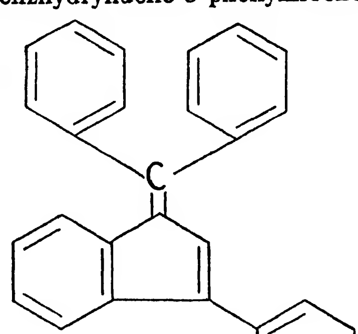
$C_{28}H_{20}$

**1-Benzhydrylidene-3-phenylindene**



M. P., °C
207–208[17]

207[18, 19]
205–206[80, 87, 88]

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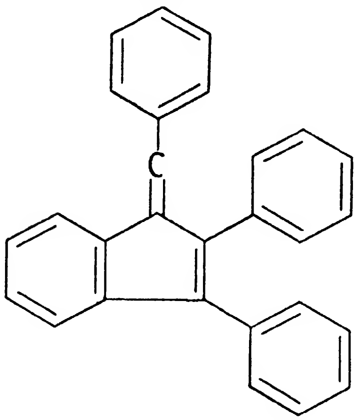
1-Benzylidene-2,3-diphenylindene



M. P., °C
184–185[58, 59, 61]

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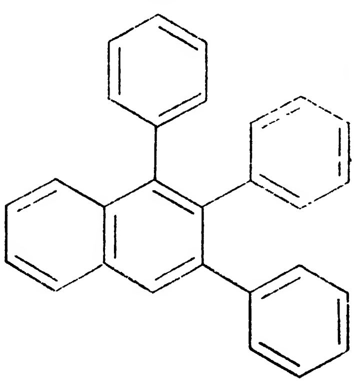
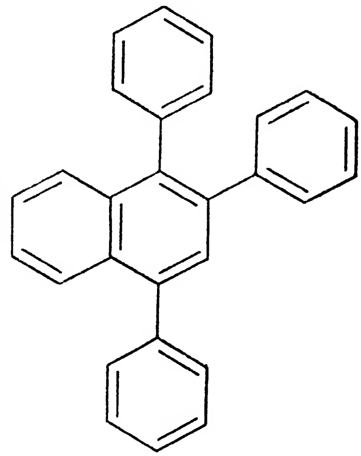
1,2,3-Triphenylnaphthalene



M. P., °C
153–154[11]
152–153.5[21]
151[65]

1,2,4-Triphenylnaphthalene



M. P., °C
158–159[15]

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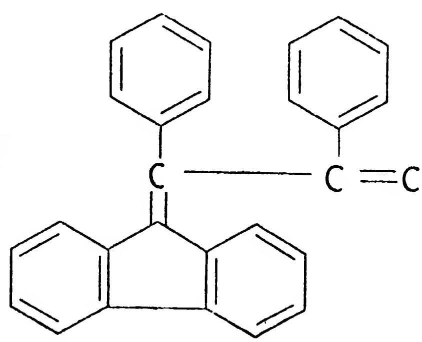
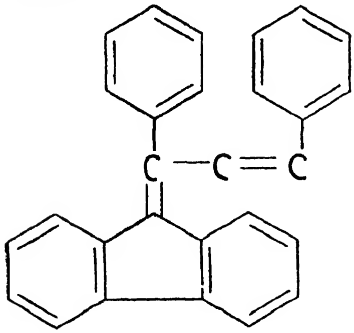
1-(9′-Fluorylidene)-1,2-diphenylpropene-2



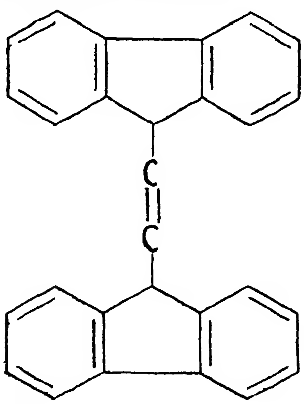
M. P., °C
197–198[49]

**1-(9′-Fluorylidene)-1,3-diphenyl-propene-2**



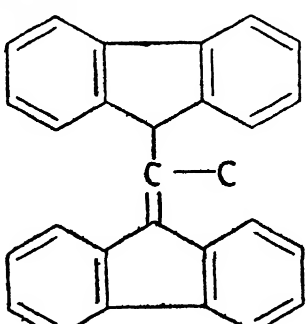
M. P., °C
183–184[9]

**1,2-Di-(9′-fluoryl)-ethene**



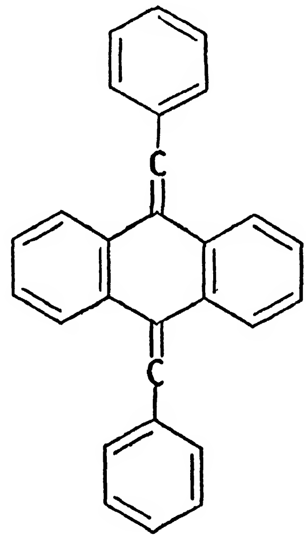
M. P., °C
267–268[83]
267[81]

**9-Fluoryl-9′-fluorylidenemethyl-methane**



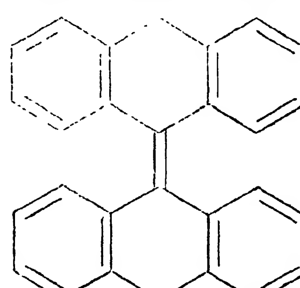
M. P., °C
>350[62]

**9,10-Dibenzylidene-9,10-dihydro-anthracene**



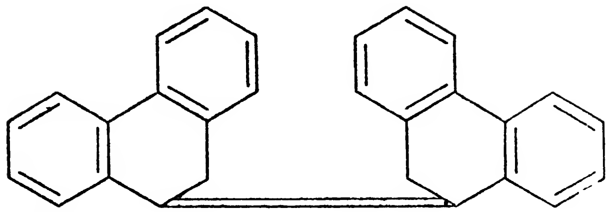
M. P., °C
237–240[51]
234–236[51]
199–200[7]

**9,9′-Bi-9,10-dihydroanthrylidene**



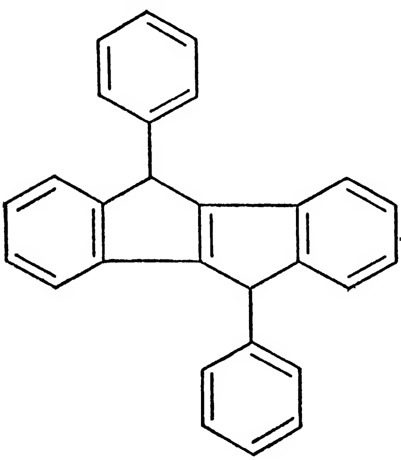
M. P., °C
298–300[55]

9,9′-Bi-9,10-dihydrophenanthrylidene



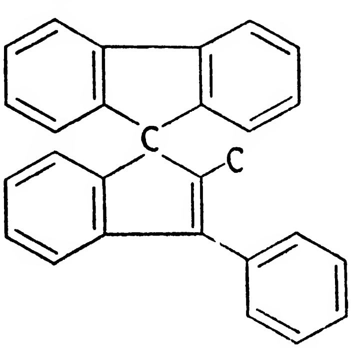
M. P., °C
303[6]

2,3,6,7-Dibenzo-4,8-diphenylbicyclo-[3,3,0]-octene-1,5



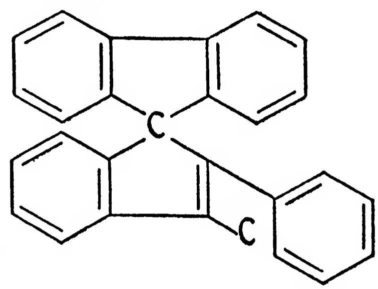
M. P., °C
285–286[20]

Spiro[2-methyl-3-phenylindene-1,9′-fluorene]



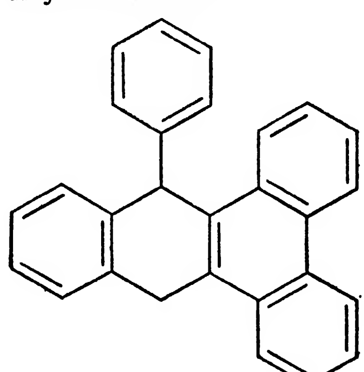
M. P., °C
173–174.5[49]

Spiro[2-phenyl-3-methylindene-1,9′-fluorene]



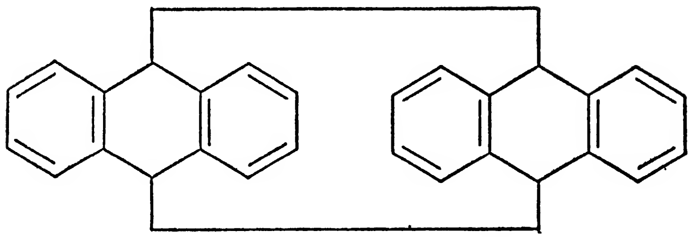
M. P., °C
152.5–153.5[49]

1,2,3,4-Dibenzo-9-phenyl-9,10-dihydroanthracene



M. P., °C
192[10]

**9,10,9′,10′-Bi-(9,10-dihydroanthrylene)**
(Paranthracene)



M. P., °C
**243.5**
244[4, 11, 78]
242–244[61]
242–243[86]
240[52]

$D_4^{20}$
1.265[61]
1.261 (a)[14]

(a) The temperature of this determination was not given.

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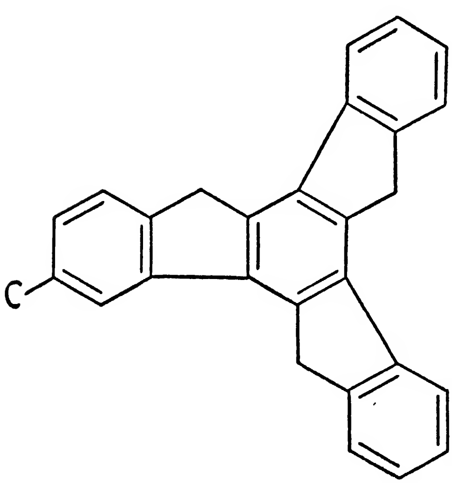
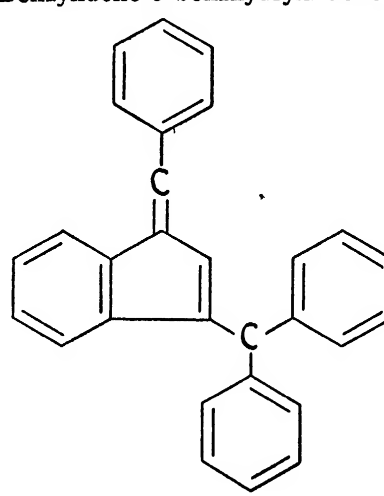
**1,2,3,4-Di-(3′,2′-indo)-5,6-[3″,2″-(5″-methylindo)]-benzene**



M. P., °C
423[71]

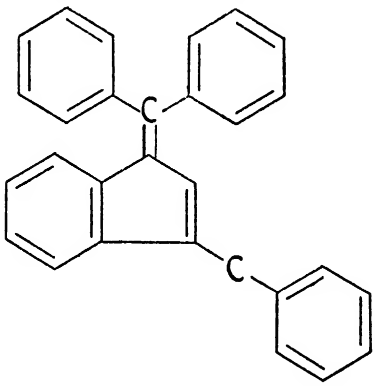
$C_{29}H_{22}$

**1-Benzylidene-3-benzhydrylindene**



M. P., °C
131.5–132.5[85]
130[28]

**1-Benzhydrylidene-3-benzylindene**



M. P., °C
130–130.5[85]

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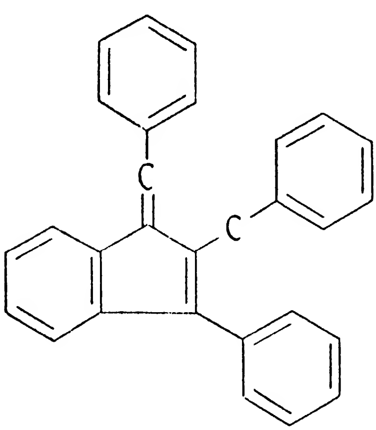
**1-Benzylidene-2-benzyl-3-phenylindene**



M. P., °C
177.5–179[16]
174–175[60]

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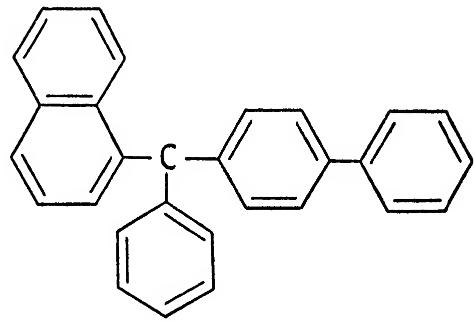
**1-Naphthyl-p-biphenylylphenylmethane**



M. P., °C
281–282[3]

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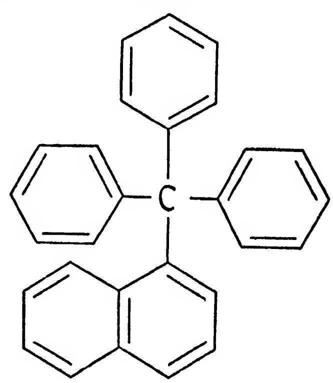
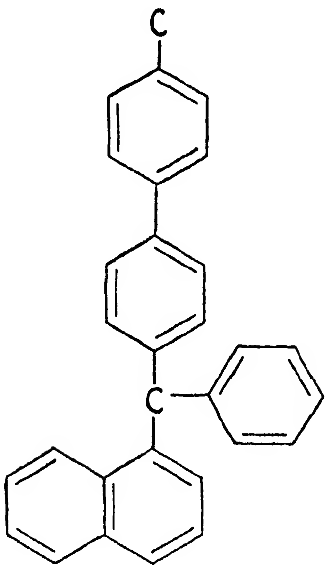
**1-Naphthyltriphenylmethane**



M. P., °C
193[79]

## $C_{30}H_{24}$

**1-Naphthyl-(4′-methyl-*p*-biphenylyl)-phenylmethane**




M. P., °C
171[37]

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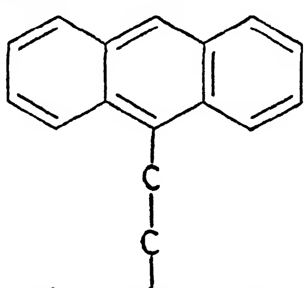
**1-(9′-Anthryl)-2-[9″-(9″,10″-dihydroanthryl)]-ethane**




M. P., °C
308[5]

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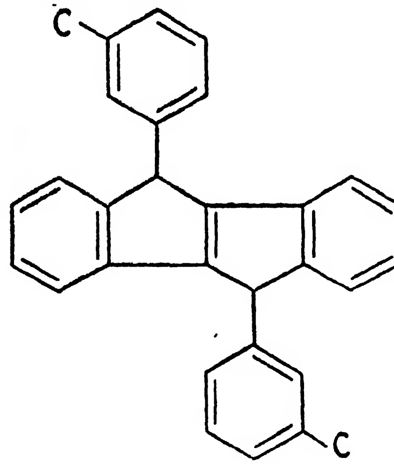
**2,3,6,7-Dibenzo-4,8-di-*m*-tolylbicyclo-[3,3,0]-octene-1,5**




M. P., °C
179–180[20]

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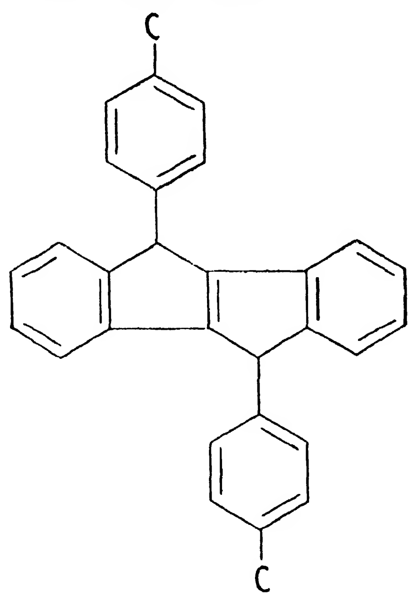
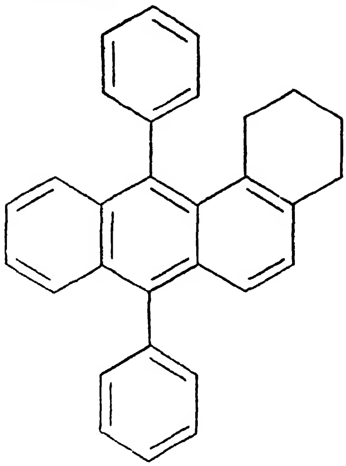
**2,3,6,7-Dibenzo-4,8-di-*p*-tolylbicyclo-[3,3,0]-octene-1,5**



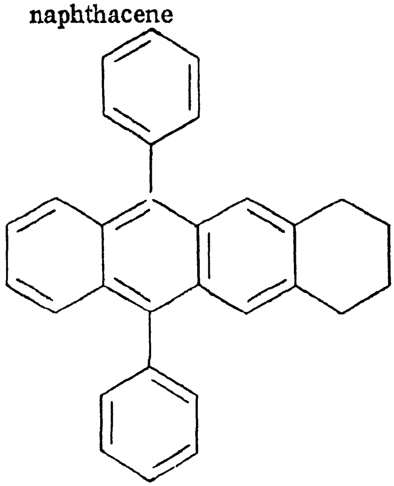

M. P., °C
200[20]

**1,2-Cyclohexano-9,10-diphenylanthracene**



M. P., °C
235–236[56]

**6,11-Diphenyl-1,2,3,4-tetrahydronaphthacene**



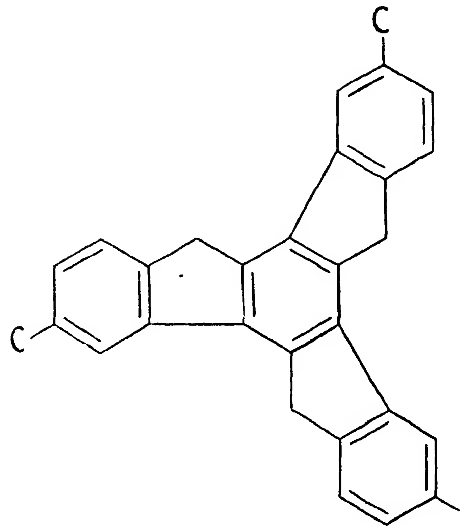
M. P., °C
298[29]

**$x_6$-Hexahydroheptacene** (a)

M. P., °C
354[54]

(a) The structure of this compound was not clearly defined in the literature.

**1,2,3,4,5,6-Tri-[3′,2′-(5′-methylindo)]-benzene**




M. P., °C
447[71]

**α-Diphenyltruxane** (a)

M. P., °C
201–202[75]

(a) The structure of this compound was not clearly defined in the literature.

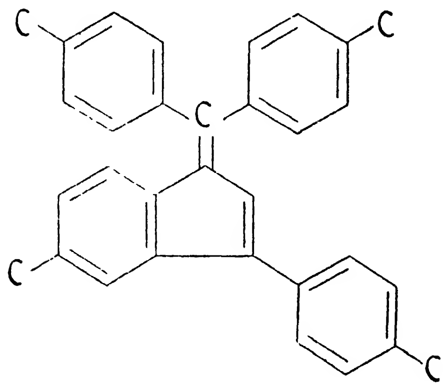
**γ-Diphenyltruxane** (a)

M. P., °C
169–171[75]

(a) The structure of this compound was not clearly defined in the literature.

$C_{32}H_{28}$

**1-(Di-*p*-tolylmethylene)-3-*p*-tolyl-5-methylindene**



M. P., °C
192–193[22]

$C_{36}H_{36}$

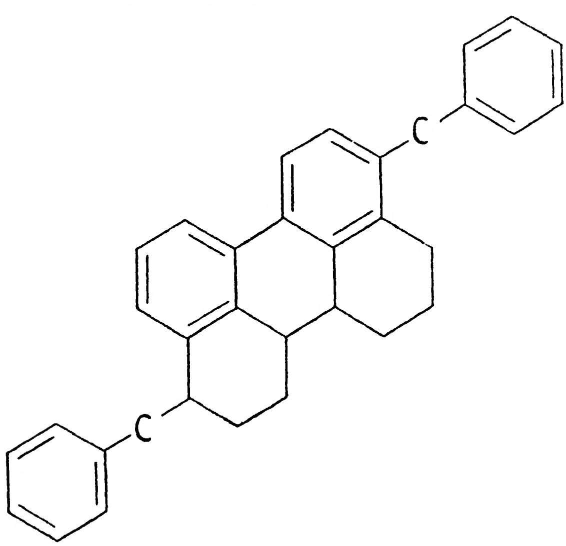
**1,2,3,4,5,6-Tri-[3′,2′-($x_6$-hexahydronaphtho)-cyclobutano]-benzene** (a)

M. P., °C
124–128[32]

(a) The structure of this compound was not clearly defined in the literature.

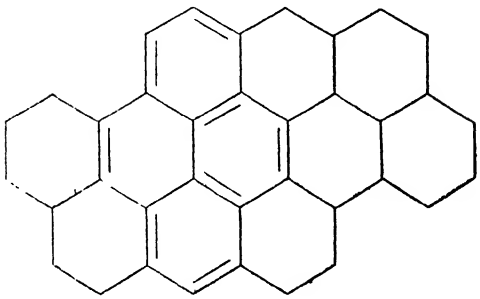
$C_{34}H_{32}$

**3,9-Dibenzyl-4,5,6,6a,6b,7,8,9-octahydroperylene**



M. P., °C
154[89]

**Didecahydronaphtho-[2′,1′,8′-bcd, 2″,1″,8″-klm]-1,2,2a,3,4,4a,5,6-octahydrocoronene**



M. P., °C
340[35]

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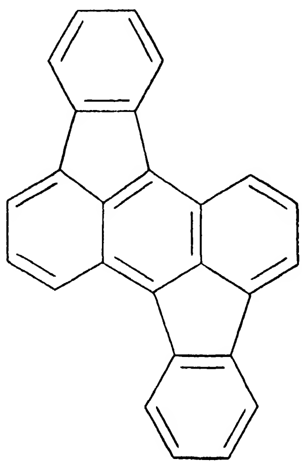
# XVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-38}$

# XVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-38}$

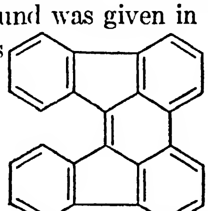
## $C_{26}H_{14}$

**Diindo-[3,2,1-de,3′,2′,1′-kl]-anthracene**
**cene**
(Rubicene)



M. P., °C
306[31]
306 (a)[36, 37]
306 (b)[26]
305 (b)[27]

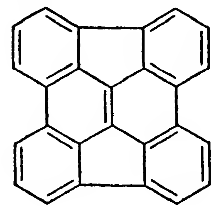
(a) The structural formula of this compound was given in the literature as



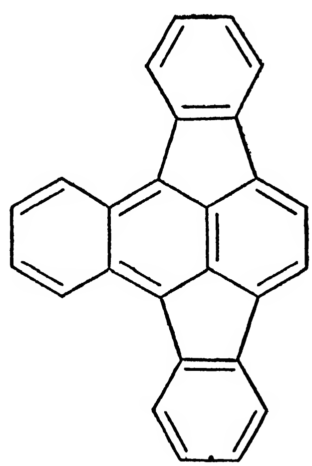
, but later work proved the above formula to be correct for rubicene.

(b) This compound is given the formula $C_{26}H_{12}$ in the literature.

The structural formula is given as follows:



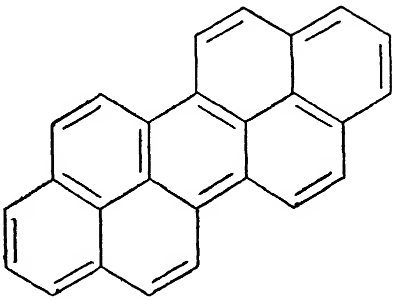
**Diindo-[3,2,1-de,3′,2′,1′-mn]-anthracene**
(Isorubicene)



M. P., °C
335 (a)[18]

(a) This compound sinters at 330.

**Dibenzo-[cd,lm]-perylene**
(Peropyrene)



M. P., °C
374–375[20]

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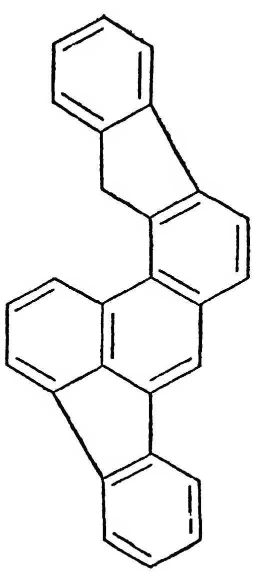
$C_{27}H_{16}$

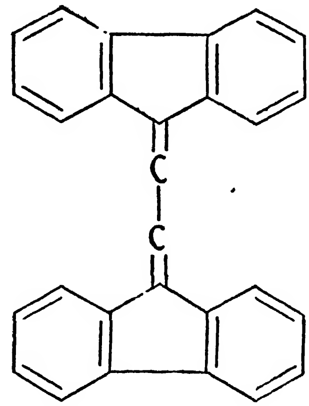
**Diindo-[3,2-c,1′,2′,3′-jk]-phenanthrene**



M. P., °C
198–199[44]

$C_{28}H_{18}$

**1,2-Di-(9′-fluorylidene)-ethane**




M. P., °C
372–374[45]
360[43]

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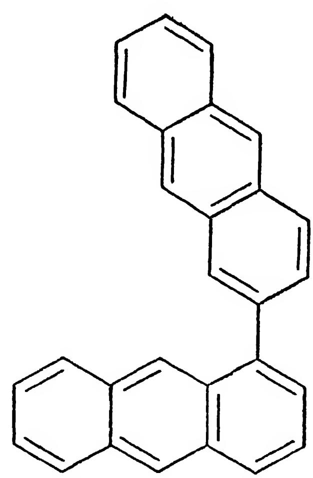
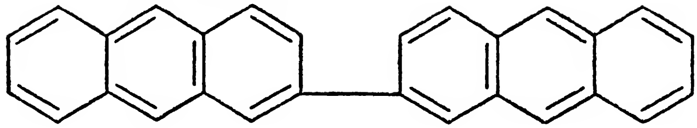
**1,2′-Bianthryl**



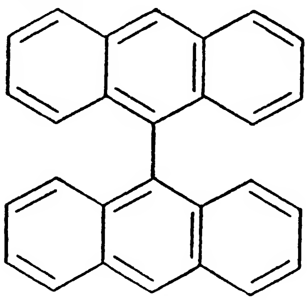
Additional Data
Sublimation Temp. (°C)
330[10]

**2,2′-Bianthryl**



M. P., °C
355–355.5[39]

**9,9′-Bianthryl**



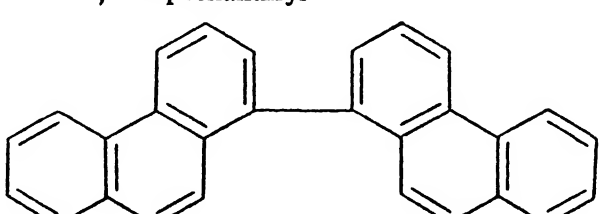
M. P., °C
319–320[25]
308–310[16, 19]
304[38]
300–302[8]
300[28, 32, 35, 40]

**Isodianthryl** (a)

M. P., °C
312[5]

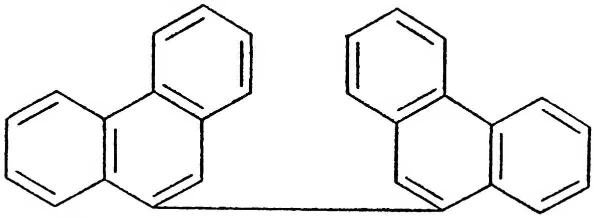
(a) The structure of this compound was not clearly defined in the literature.

**1,1′-Biphenanthryl**



M. P., °C
224–226[30]

**9,9′-Biphenanthryl**



M. P., °C
188–189[46]
184–185[3]

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**x, x′-Biphenanthryl** (a)

M. P., °C
308[34]

(a) The structure of this compound was not clearly defined in the literature.

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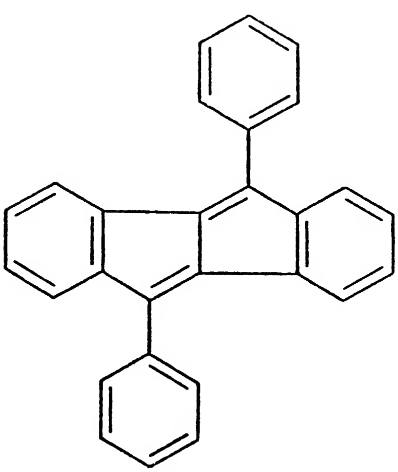
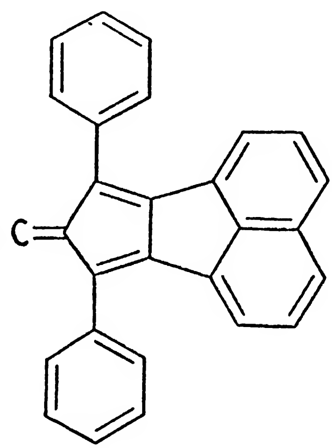
**3,4,7,8-Dibenzo-2,6-diphenylbicyclo-[3,3,0]-octadiene-1,5**



M. P., °C
259–260[11]
259[13]

**1,4-Diphenyl-2,3-(2′,1′-acenaphtho)-5-methylenecyclopentadiene-1,3**



M. P., °C
225–226[23]

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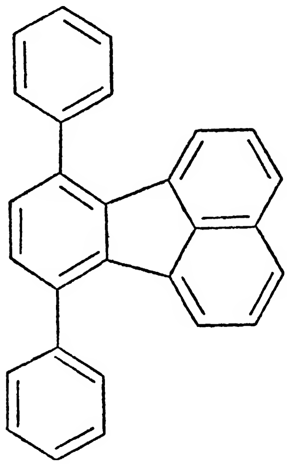
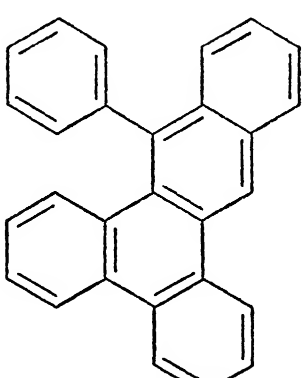
*This series continued on next page*

**1,4-Diphenyl-2,3-(2′,1′-acenaphtho)-benzene**



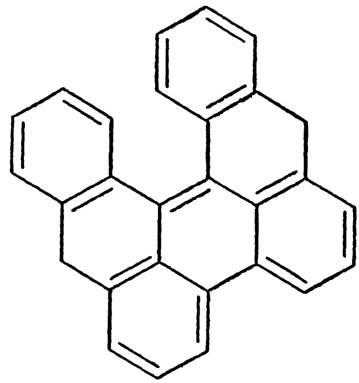
M. P., °C
162–163[22]
160–161[1]

**2,3-Benzo-1-phenyltriphenylene**



M. P., °C
227[6, 9]

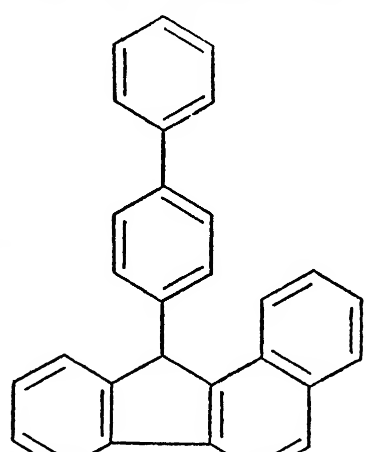
**1,2,11,12-Dibenzo-3,10-dihydro-perylene**



M. P., °C
269–270[17]

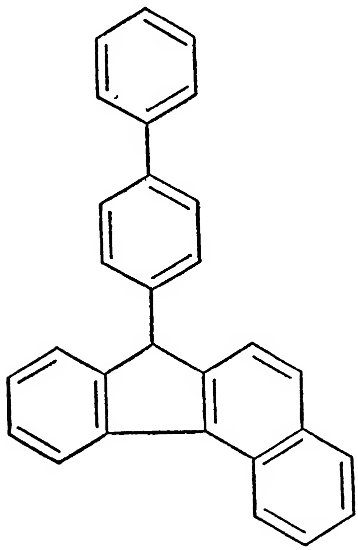
$C_{29}H_{20}$

1,2-Benzo-9-*p*-biphenylylfluorene



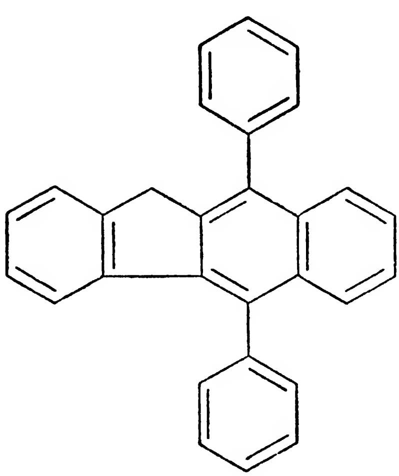
M. P., °C
276[28A]

**3,4-Benzo-9-*p*-biphenylylfluorene**



M. P., °C
275–276[21]

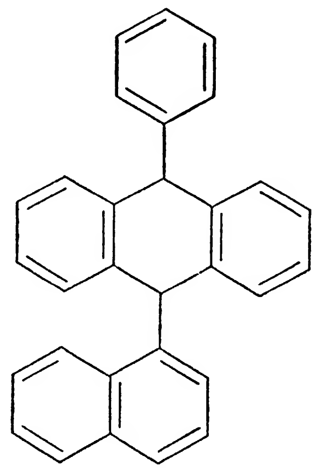
**2,3-Benzo-1,4-diphenylfluorene**



M. P., °C
199[42]

$C_{30}H_{22}$

**9-Phenyl-10-(1′-naphthyl)-9,10-dihydroanthracene**



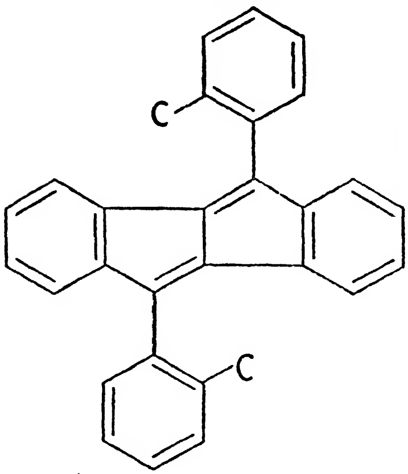
M. P., °C
225[29]

**x,x-(x′,x″-Diphenanthryl)-ethane** (a)

M. P., °C
252.5–254.5[41]

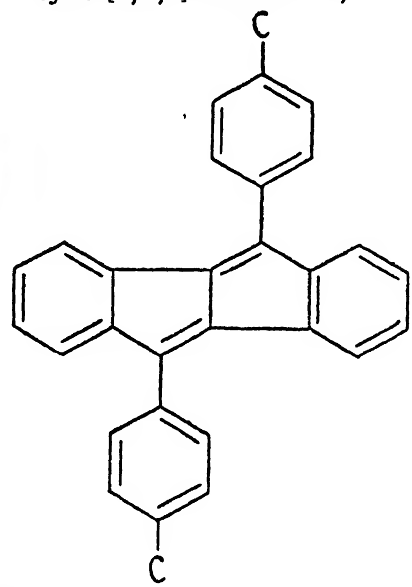
(a) The structure of this compound was not clearly defined in the literature.

**3,4,7,8-Dibenzo-2,6-di-*o*-tolylbicyclo-[3,3,0]-octadiene-1,5**



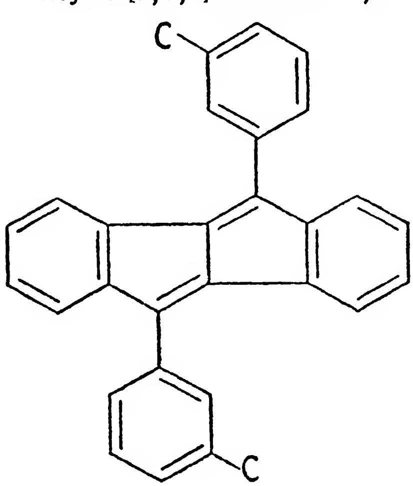
M. P., °C
240[12]

**3,4,7,8-Dibenzo-2,6-di-*p*-tolylbicyclo-[3,3,0]-octadiene-1,5**



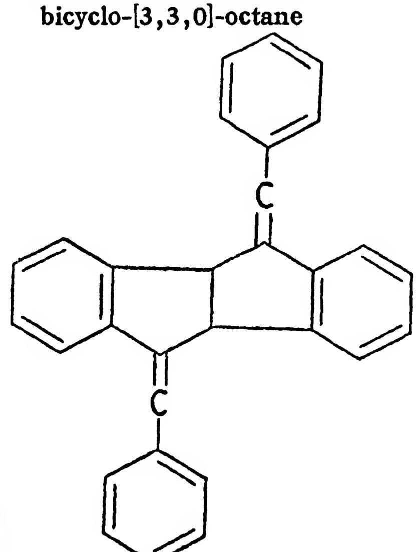
M. P., °C
271–272[11]
271[13]

**3,4,7,8-Dibenzo-2,6-di-*m*-tolylbicyclo-[3,3,0]-octadiene-1,5**



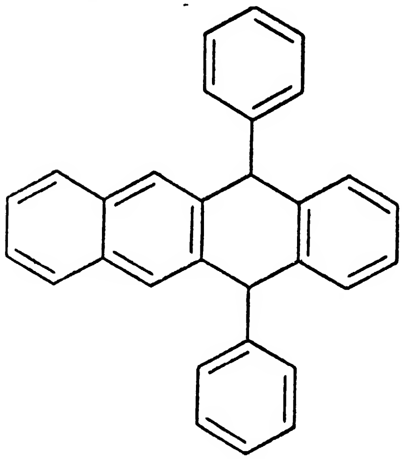
M. P., °C
184–185[12]
184[13]

**3,4,7,8-Dibenzo-2,6-dibenzylidenebicyclo-[3,3,0]-octane**



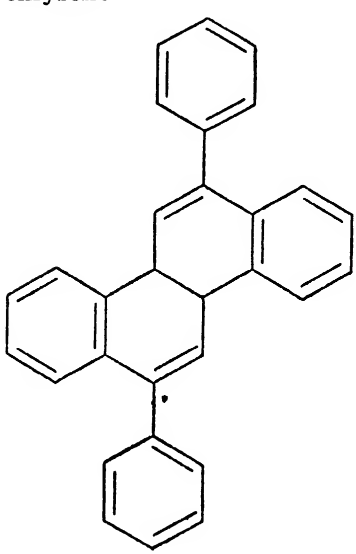
M. P., °C
255[14, 15]

5,12-Diphenyl-5,12-dihydronaphthacene



M. P., °C
206–207[21]

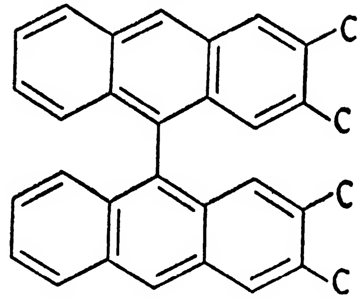
6,12-Diphenyl-4b,10b-dihydrochrysene



M. P., °C
265–266[23]

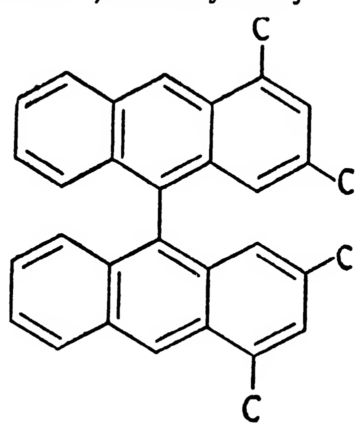
$C_{32}H_{26}$

9,9′-Bi-2,3-dimethylanthryl



M. P., °C
310[4]

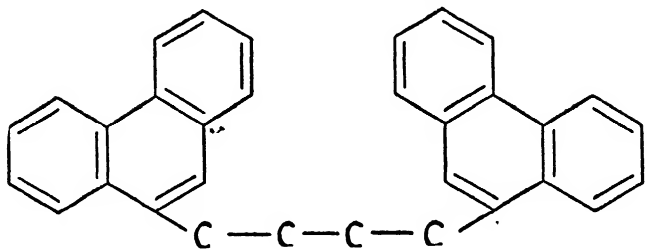
10,10′-Bi-1,3-dimethylanthryl



M. P., °C
284[4]

*This series continued on next page*

1,4-Di-(9′-phenanthryl)-butane



M. P., °C
214–216[7]

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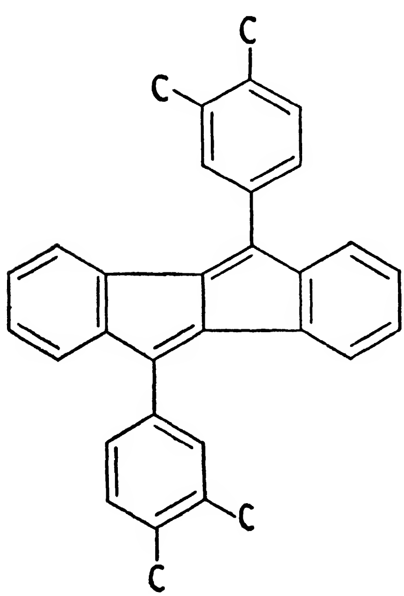
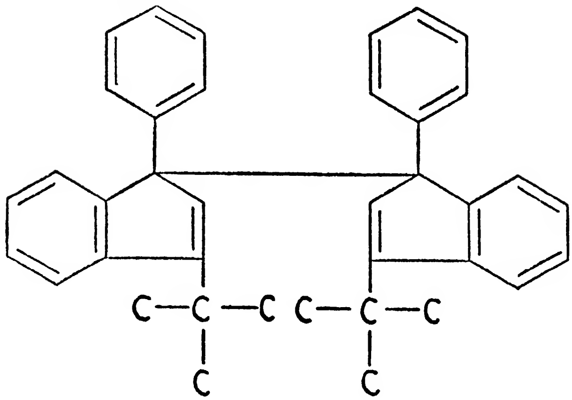
3,4,7,8-Dibenzo-2,6-di-(3′,4′-dimethylphenylbicyclo-[3,3,0]-octadiene-1,5



M. P., °C
212[12]

*This series continued on next page*

## $C_{38}H_{38}$
## 1,1′-Bi-(1-phenyl-3-*tert*-butylindenyl)



| M. P., °C |
|---|
| 150–151[2] |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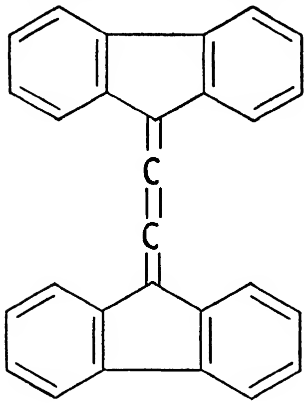
# XVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-40}$

# XVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-40}$

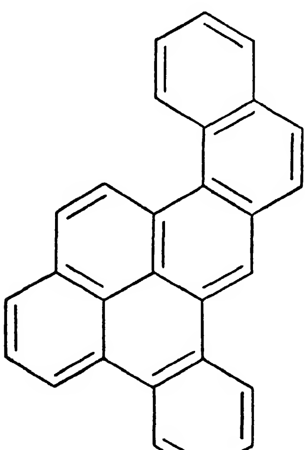
## $C_{28}H_{16}$

**1,2-Di-(9′-fluorylidene)-ethene**



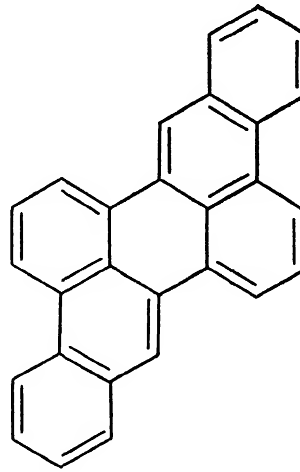
M. P., °C
330[32]

**1,2-(4′,3′-Naphtho)-4,5-benzopyrene**



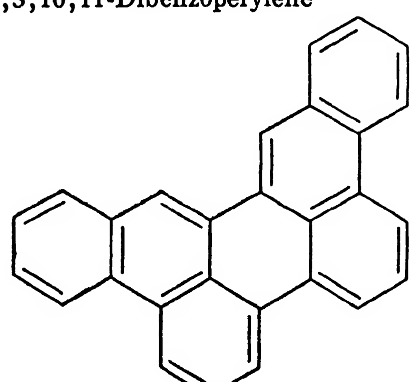
M. P., °C
242–244[24]

**2,3,8,9-Dibenzoperylene**



M. P., °C
310–343[26, 27]
299–300[39]

**2,3,10,11-Dibenzoperylene**



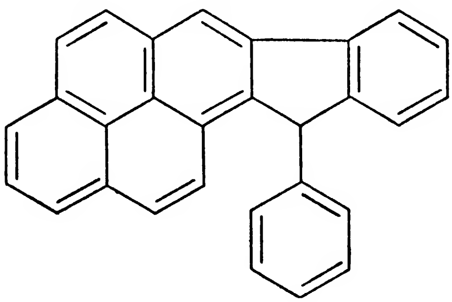
M. P., °C
343–345 (a)[39]
343 (a)[9, 14]
315–318 (a)[26, 27]

(a) Clar ("Aromatische Kohlenwasserstoffe," Springer-Verlag, Berlin, 1941, p. 236) indicates that

these are three different compounds, but does not assign a definite structure to the compound in references 26, 27, and 39.

$C_{29}H_{18}$

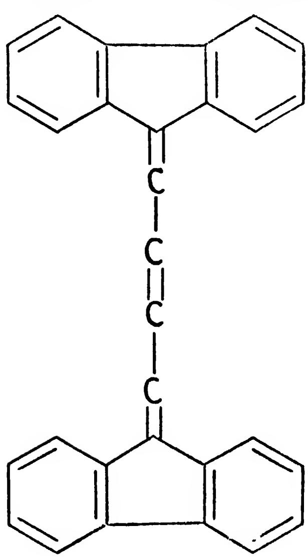
**2,3-[3′,2′-(1′-Phenylindo)]-pyrene**



M. P., °C
279–280[15]

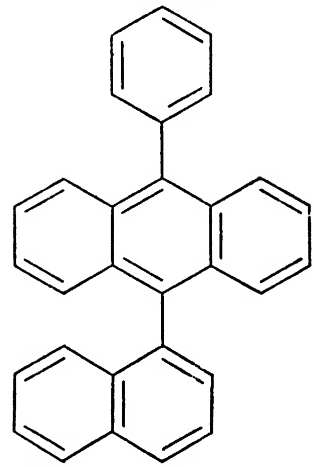
$C_{30}H_{20}$

**1,4-Di-(9′-fluorylidene)-butene-2**



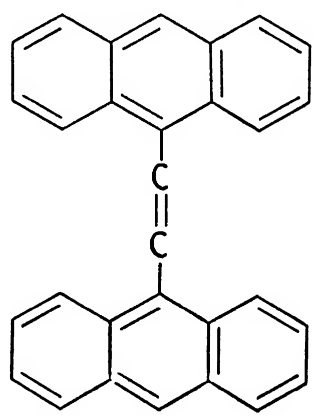
M. P., °C
340[34]
331–332[33]

**9-Phenyl-10-(1′-naphthyl)-anthracene**



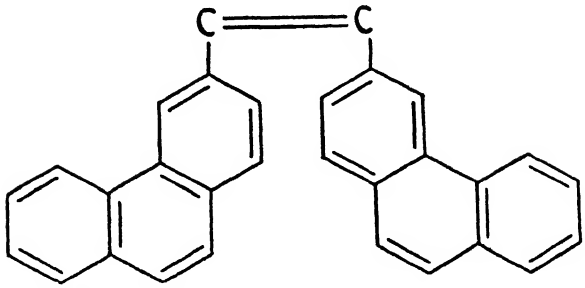
M. P., °C
244–245[4]
229[25]

**1,2-Di-(9′-anthryl)-ethene**



M. P., °C
337[38]

1,2-Di-(3′-phenanthryl)-ethene



M. P., °C
289[33]

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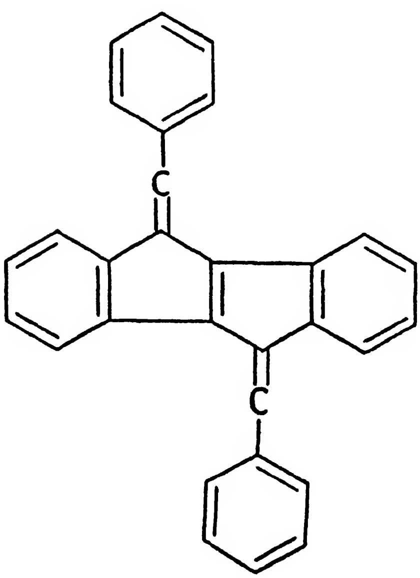
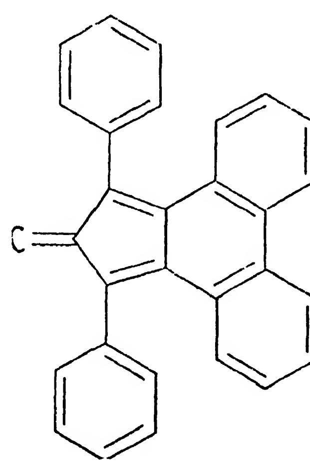
2,3,6,7-Dibenzo-4,8-dibenzylidene-bicyclo-[3,3,0]-octene-1,5



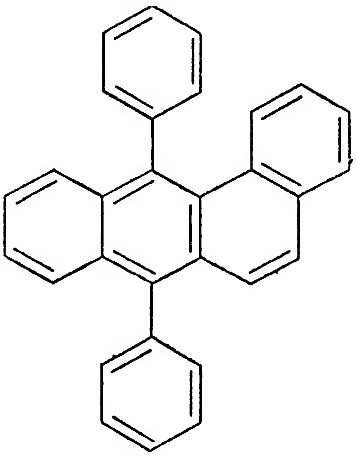
M. P., °C
244[8]

2,3-(9′,10′-Phenanthro)-1,4-diphenyl-5-methylenecyclopentadiene-1,3



M. P., °C
239–240[18]

**1,2-Benzo-9,10-diphenylanthracene**



M. P., °C
192[13]

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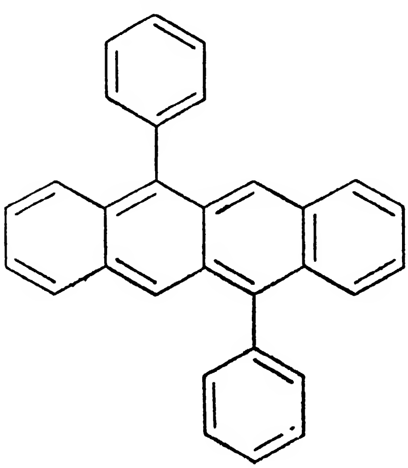
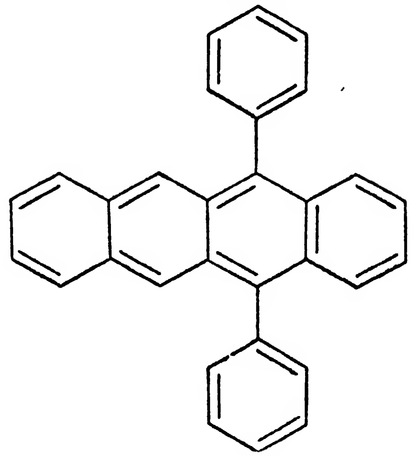
**5,11-Diphenylnaphthacene**
(Diphenylrubene)



M. P., °C
301–302[21]

**5,12-Diphenylnaphthacene**



M. P., °C
207–208[20]

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**x,x-Diphenylnaphthacene** (a)

M. P., °C
258[22]

(a) The structure of this compound was not clearly defined in the literature.

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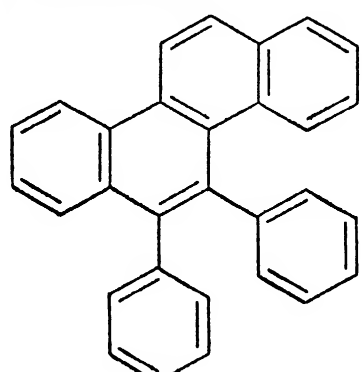
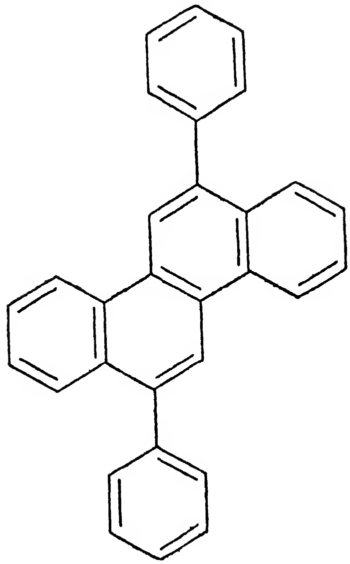
**5,6-Diphenylchrysene**



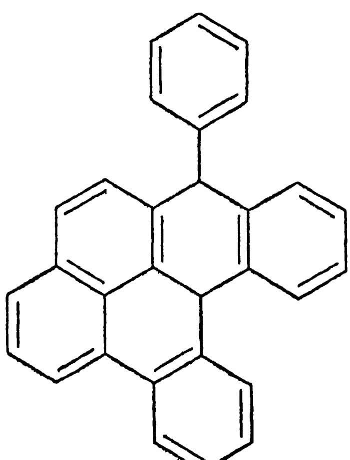
M. P., °C
208–209[17]

6,12-Diphenylchrysene



M. P., °C
285[35]

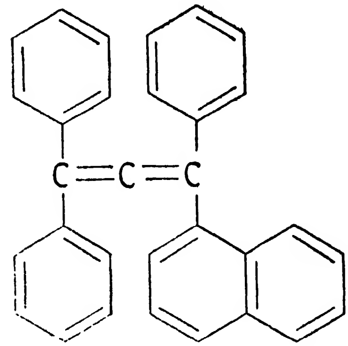
2,3,4,5-Dibenzo-1-phenyl-1,3a-dihydropyrene



M. P., °C
257–258[13]

$C_{31}H_{22}$

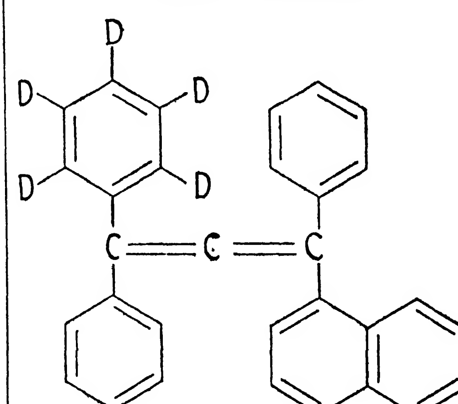
1,1,3-Triphenyl-3-(1′-naphthyl)-propadiene



M. P., °C
142 (a)[16]
100–102 (a)[16]

(a) These constants were determined on different crystalline forms.

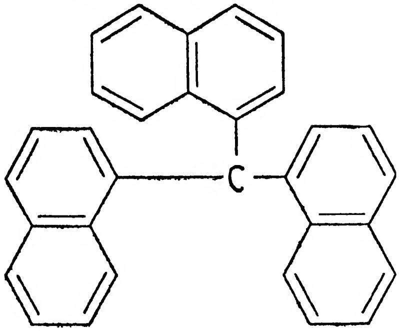
1,3-Diphenyl-1-pentadeuterophenyl-3-(1′-naphthyl)-propadiene




M. P., °C
142 (a)[16]
100-101 (a)[16]

(a) These constants were determined on different crystalline forms.

**Tri-(1-naphthyl)-methane**



M. P., °C
191[11]

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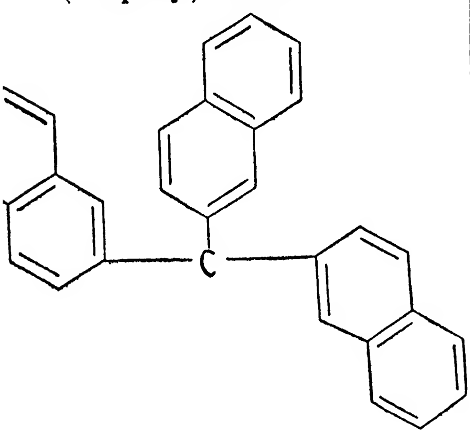
**Tri-(2-naphthyl)-methane**



M. P., °C
178–179[12]

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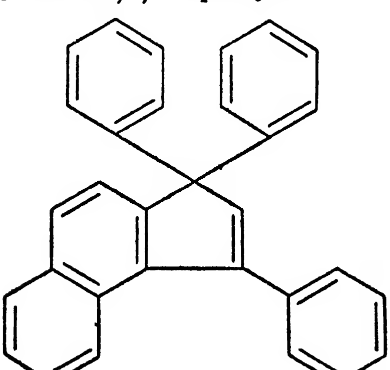
**4,5-Benzo-1,1,3-triphenylindene**



M. P., °C
234[16]

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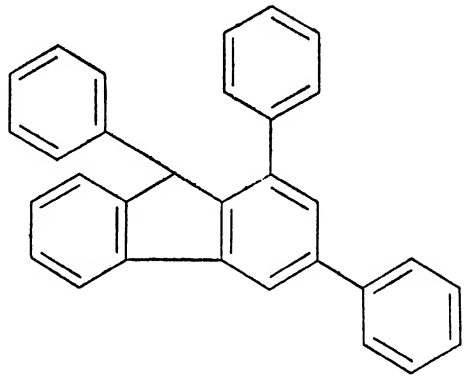
**1,3,9-Triphenylfluorene**



M. P., °C
149[31]

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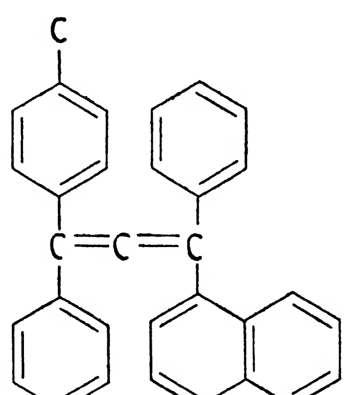
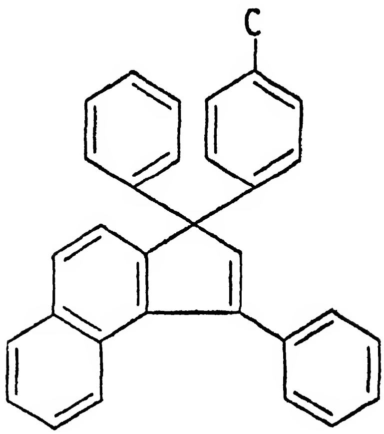
## $C_{32}H_{24}$

**1,3-Diphenyl-1-*p*-tolyl-3-(1′-naphthyl)-propadiene**



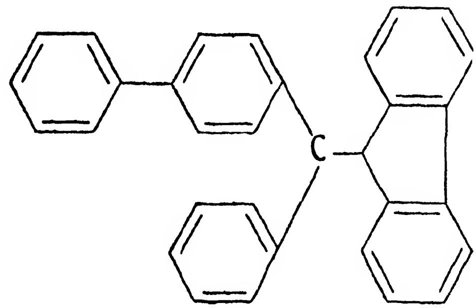
M. P., °C
119–120[16]

4,5-Benzo-1,3-diphenyl-1-*p*-tolylindene



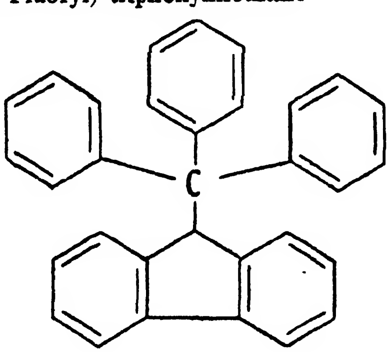
M. P., °C
172–175[16]

Phenyl-*p*-biphenylyl-(9′-fluoryl)-methane



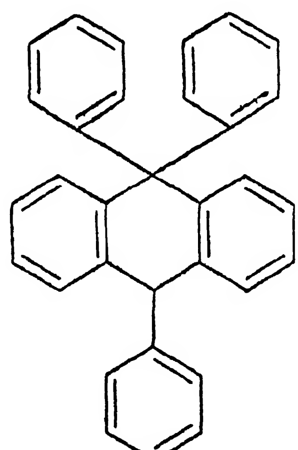
M. P., °C
253–254[6]

(9-Fluoryl)-triphenylmethane



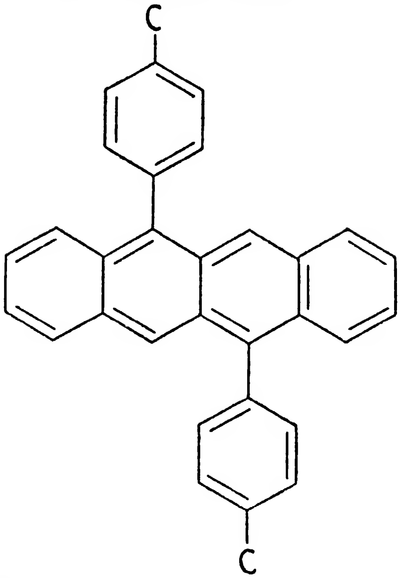
M. P., °C
258–260[28]
248–256 (in nitrogen)[2]
234–235[2]

9,9,10-Triphenyl-9,10-dihydro-anthracene



M. P., °C
230[3]
226–227[37]
223–225[29]

**5,11-Di-*p*-tolylnaphthacene**



M. P., °C
335–336[36]

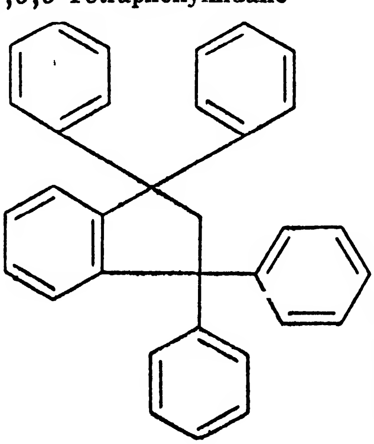
**x,x-Dibenzylchrysene** (a)

M. P., °C
254[23]

(a) The structure of this compound was not clearly defined in the literature.

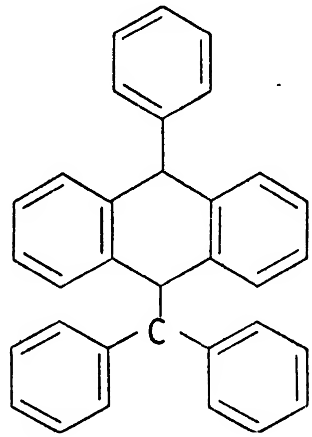
**$C_{33}H_{26}$**

**1,1,3,3-Tetraphenylindane**



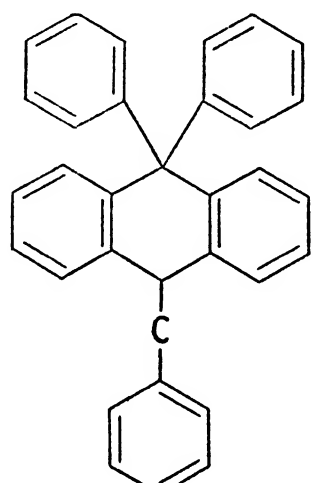
M. P., °C
191–192[30]

**9-Phenyl-10-benzhydryl-9,10-dihydroanthracene**



M. P., °C
217[5]

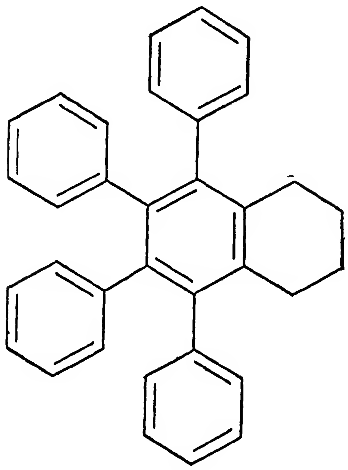
**9,9-Diphenyl-10-benzyl-9,10-dihydroanthracene**



M. P., °C
192[7]

## $C_{34}H_{28}$

### 5,6,7,8-Tetraphenyl-1,2,3,4-tetrahydronaphthalene



M. P., °C
271–272[19]

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### x,x-Diphenyl-$x_6$-hexahydropentacene (a)

M. P., °C
252[1]

(a) The structure of this compound was not clearly defined in the literature, but the phenyl groups are probably in the 6- and 13-positions.

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## $C_{36}H_{32}$

### Tetraindene (a)

M. P., °C
109–110[10]

(a) The structure of this compound was not clearly defined in the literature.

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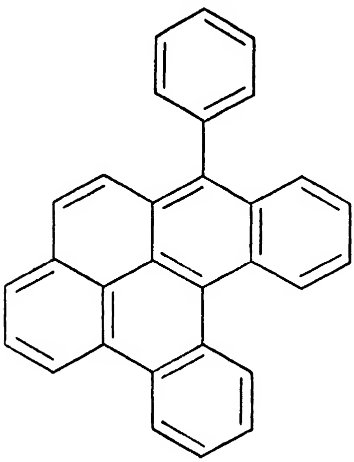
# XIX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-42}$

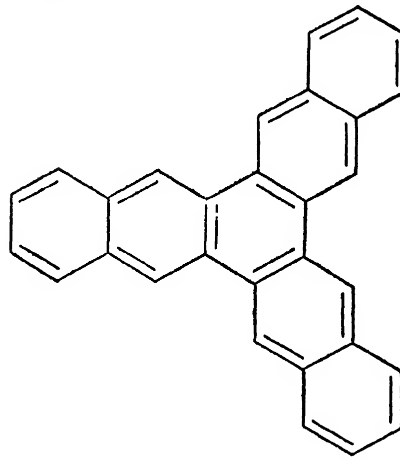
$C_{30}H_{18}$

**2,3,4,5-Dibenzo-1-phenylpyrene**



M. P., °C
242–243[11]

**1,2,3,4-Di-(3′,2′-naphtho)-anthracene**



M. P., °C
392[19]
390[19]
388[19]
387[19]

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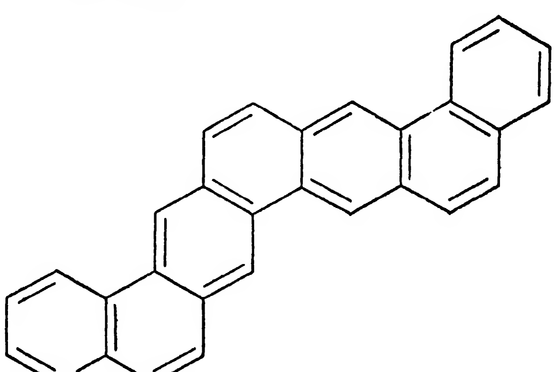
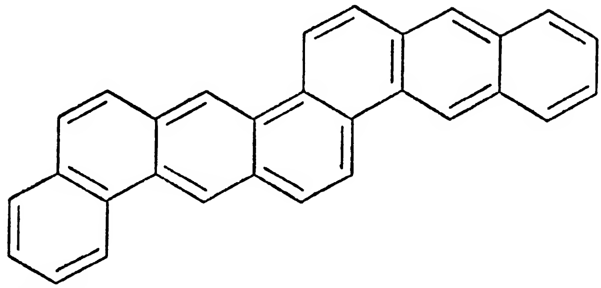
**1,2-Benzo-5,6-(2′,3′-phenanthro)-anthracene**



M. P., °C
398–399[14]

**2,3-Benzo-8,9-(4′,3′-naphtho)-chrysene**



M. P., °C 435–440 (a)[16]

(a) This compound melts with decomposition.

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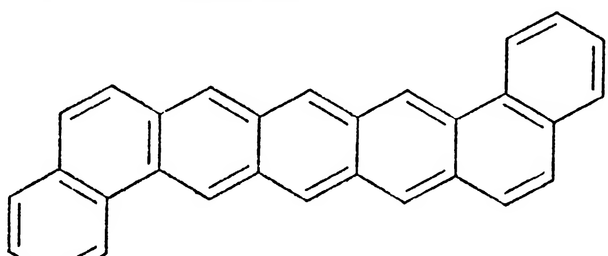
**1,2,8,9-Dibenzopentacene**



M. P., °C 410 (a)[18]

(a) This compound melts with decomposition.

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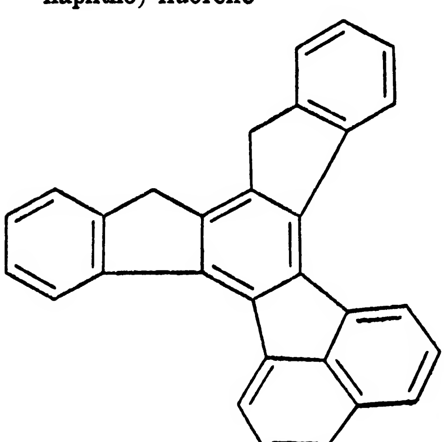
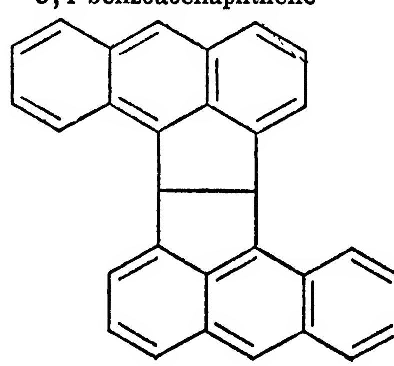
**1,2-(2′,3′-Indo)-3,4-(2′,1′-acenaphtho)-fluorene**



M. P., °C
299[17]

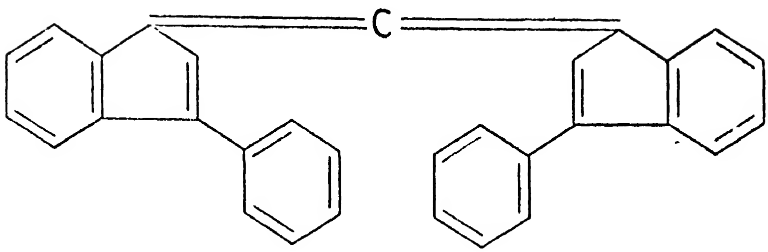
**1,2-[2′,1′-(3,4′-Benzoacenaphtheno)]-3,4-benzoacenaphthene**



M. P., °C
349[12]

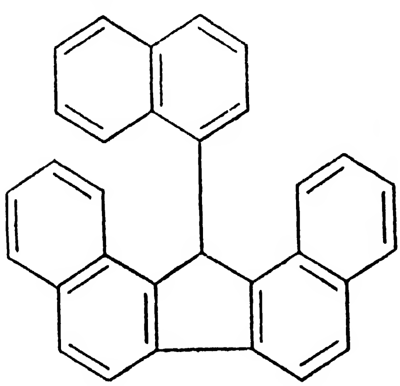
$C_{31}H_{20}$

**Di-(3-phenylindenylidene)-methane**



M. P., °C
205–206[7]

**1,2,7,8-Dibenzo-9-(1′-naphthyl)-fluorene**



M. P., °C
191[8,9]

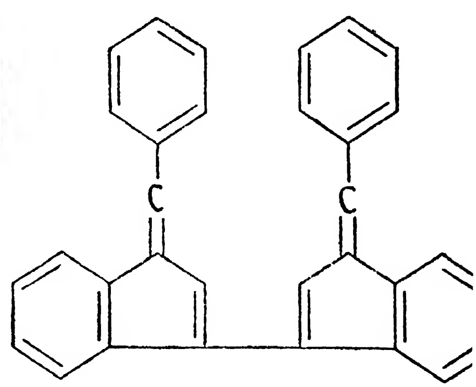
**2,3,6,7-Dibenzo-x-(2′-naphthyl)-fluorene (a)**

M. P., °C
235–237 (in carbon dioxide)[10]

(a) The structure of this compound was not clearly defined in the literature.

$C_{32}H_{22}$

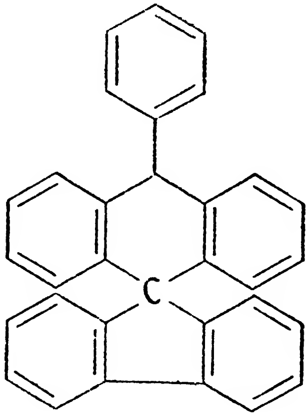
**Bi-3,3′-(1-Benzylideneindenyl)**



M. P., °C
217.5[21]

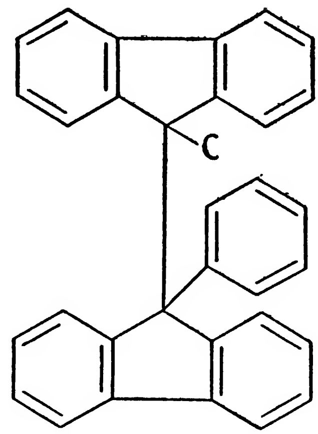
*This series continued on next page*

**Spiro[9-phenyl-9,10-dihydroanthracene-10,9′-fluorene]**



M. P., °C
267–268[15]

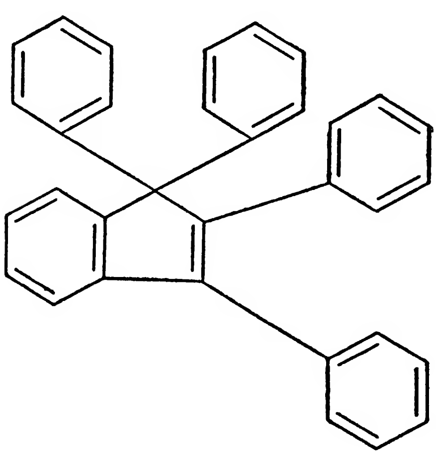
**9-Phenyl-9′-methyl-9,9′-bifluorenyl**



M. P., °C
161[22]

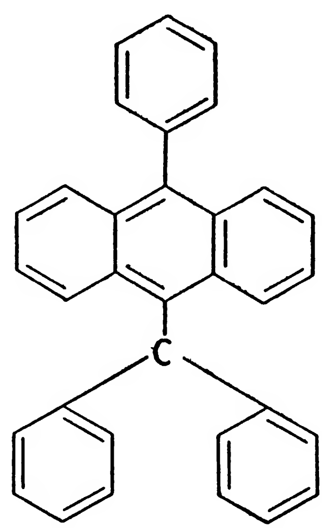
$C_{33}H_{24}$

**1,1,2,3-Tetraphenylindene**



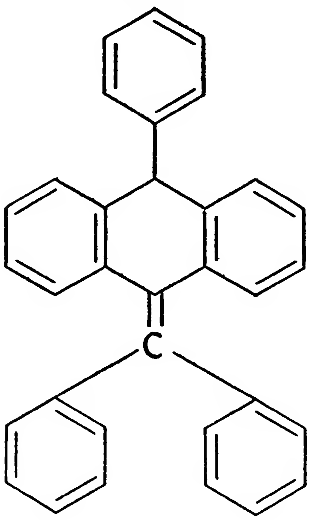
M. P., °C
149–150[18]

**9-Phenyl-10-benzhydrylanthracene**



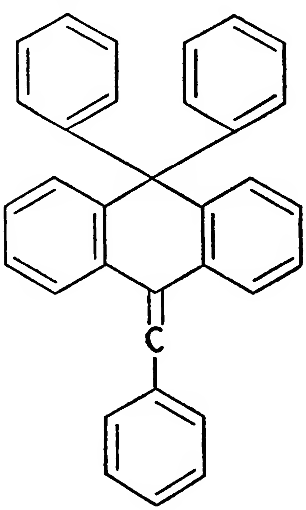
M. P., °C
154–155[4]

9-Phenyl-10-benzhydrylidene-9,10-dihydroanthracene



M. P., °C
218[4]

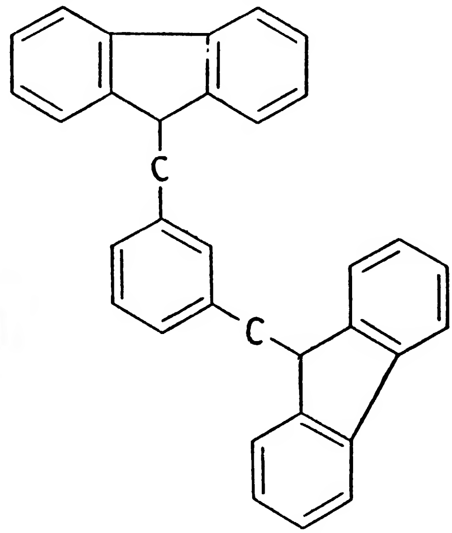
9,9-Diphenyl-10-benzylidene-9,10-dihydroanthracene



M. P., °C
254–255[2]
249[6]

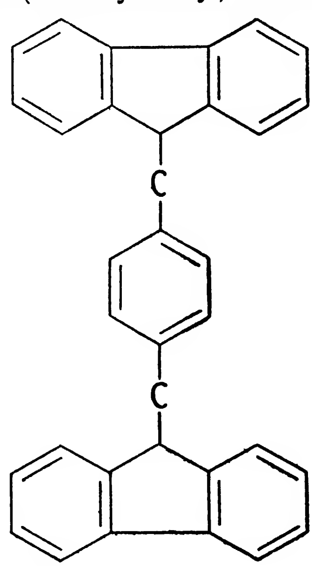
$C_{34}H_{26}$

1,3-Di-(9′-fluorylmethyl)-benzene



M. P., °C
119–120[20]

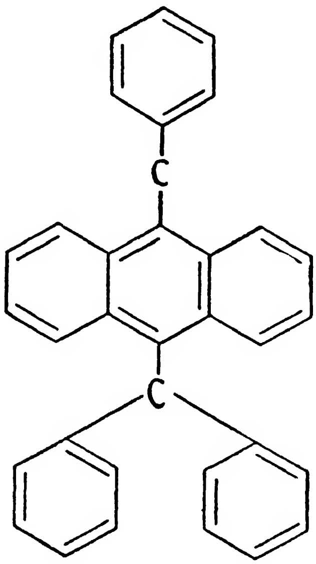
1,4-Di-(9′-fluorylmethyl)-benzene



M. P., °C
239–240[20]

**9-Benzyl-10-benzhydrylanthracene**

*This series continued on next page*



M. P., °C
236[3]

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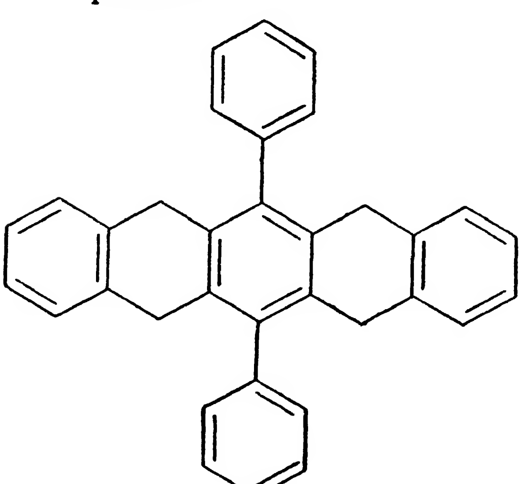
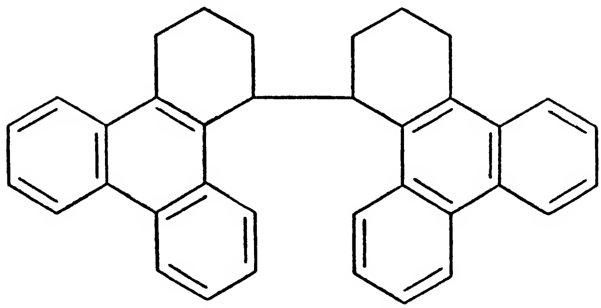
**6,13-Diphenyl-5,7,12,14-tetrahydropentacene**



M. P., °C
329–331[1]

# $C_{36}H_{30}$

## 4,4'-Bi-(1,2,3,4-tetrahydrotriphenylenyl)



| M. P., °C |
|---|
| 300[5] |

*References on Polynuclear Aromatics of Empirical Formula $C_nH_{2n-12}$*

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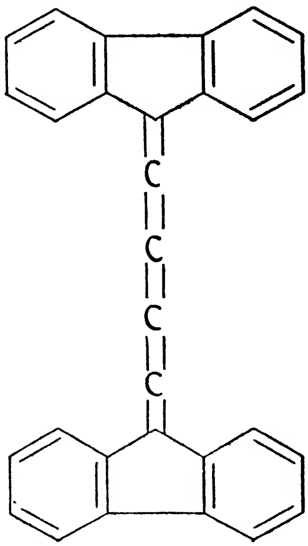
# XX. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-44}$

**$C_{30}H_{16}$**

**1,4-Di-(9'fluorylidene)-butatriene**



M. P., °C
441–442[9]

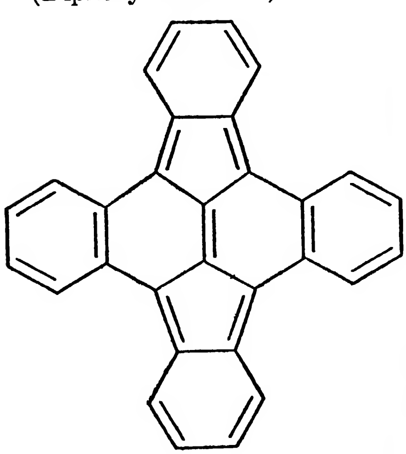
M. P., °C
465[3, 5]

Additional Data
Sublimation Temp. (°C)

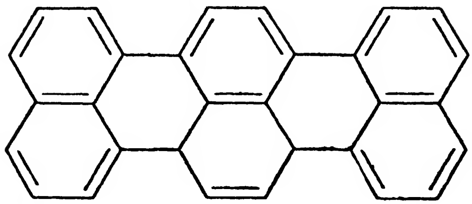
| | |
|---|---|
| 270–275 | 0.1 mm[5] |

*This series continued on next page*

**Diindo-[3,2,1-fg,3',2',1'-op]-naphthacene**
(Diphenylenerubene)

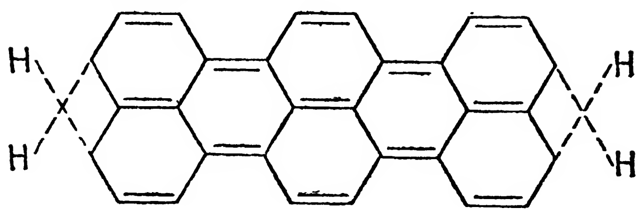


**Dinaphtho-[1,8-ab,1',8'-hi]-pyrene**
(Chalcacene) (a)



M. P., °C
358–360[6, 7]

(Rhodacene) (b)



M. P., °C
338–340[6]

(a) This name is given to the form of the compound having a benzenoid structure.

(b) This name is given to the form of the compound having a quinoid structure.

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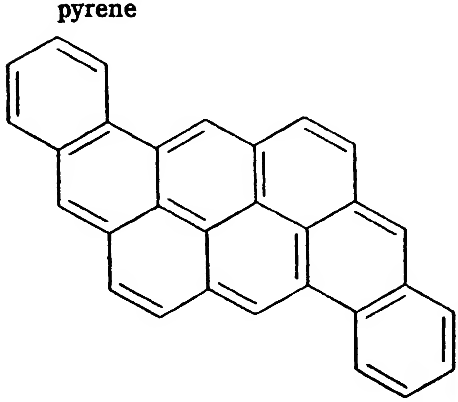
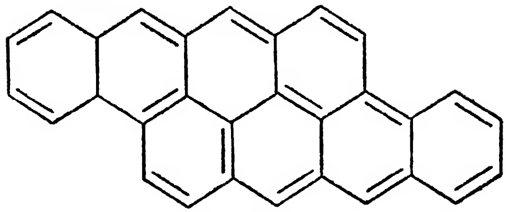
**Dinaphtho-[3,2,1-cd,3',2',1'-jk]-pyrene**



M. P., °C
372–373[4]

*This series continued on next page*

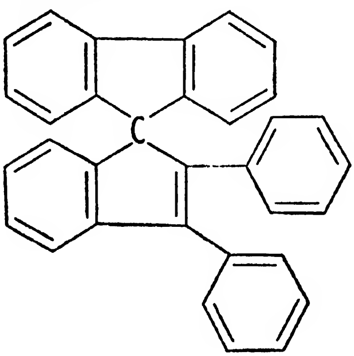
**Dinaphtho-[4,3,2-cd,4′,3′,2′-jk]-pyrene**



M. P., °C 382-390[4]

$C_{33}H_{22}$

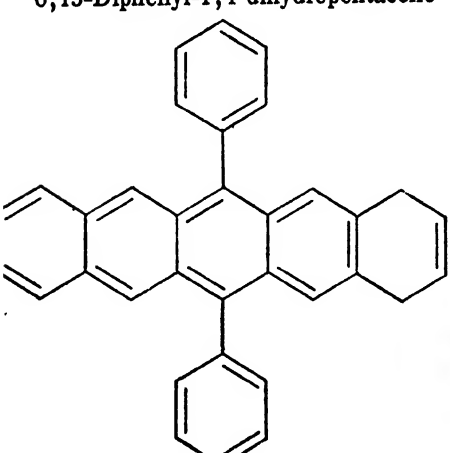
**Spiro [2,3-diphenylindene-1,9′-fluorene]**



M. P., °C 174-175[3]

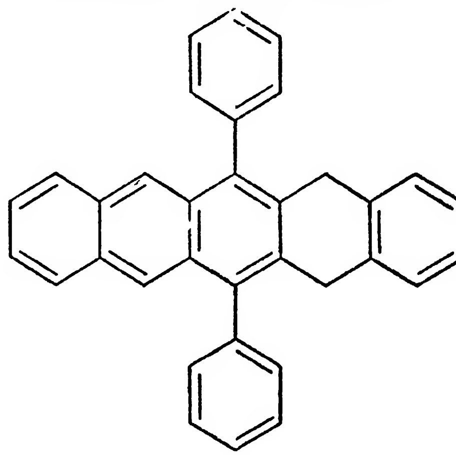
$C_{34}H_{24}$

**6,13-Diphenyl-1,4-dihydropentacene**



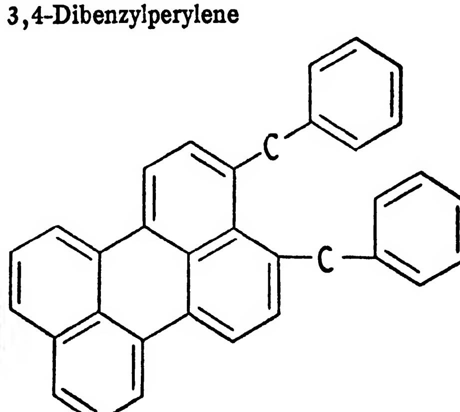
. P., °C 295[1]

**6,13-Diphenyl-5,14-dihydropentacene**



M. P., °C 247-248[1]

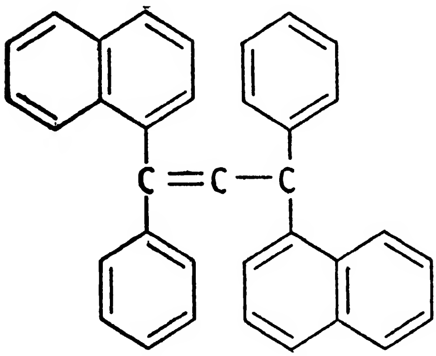
**3,4-Dibenzylperylene**



M. P., °C 329-330[12]

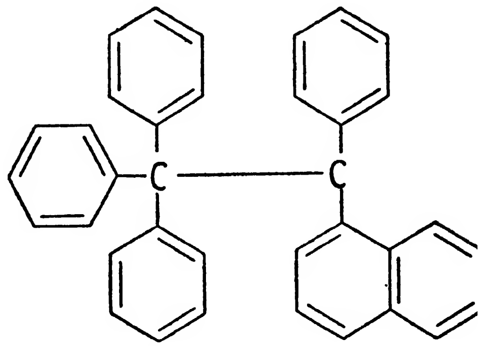
$C_{35}H_{26}$

**1,3-Diphenyl-1,3-di-(1′-naphthyl)-propene-1**



M. P., °C
167–169[11]

**1,1,1,2-Tetraphenyl-2-(1′-naphthyl)-ethane**



M. P., °C
194–196 (in nitrogen)[2]
184–194 (in air)[2]

*References on Polynuclear Aromatics of Empirical Formula $C_nH_{2n-44}$*

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2. Bachmann, W. E., J. Am. Chem. Soc. **55**, 2135 **1939**.

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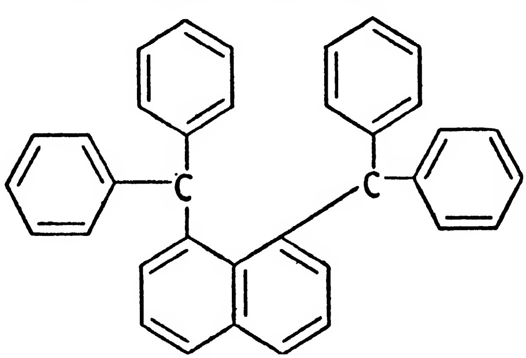
$C_{36}H_{28}$

**1,8-Dibenzhydrylnaphthalene**



M. P., °C
243[12]

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4. Clar, E., Ber. **76,** 328 **1943.**
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11. Maitland, P., and W. H. Mills, J. Chem. Soc. **1936,** 987.
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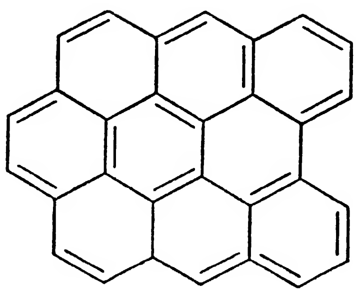
# XXI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-46}$

## XXI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-46}$

### $C_{30}H_{14}$

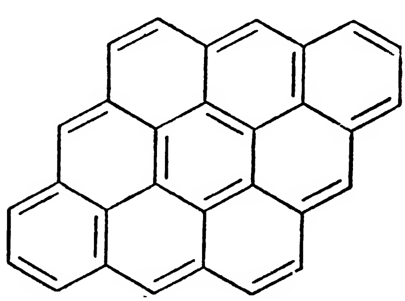
**Dibenzo-[bc,ef]-coronene**



Additional Data
Sublimation Temp. (°C)

| | |
|---|---|
| ca 500 | 1 mm[13] |

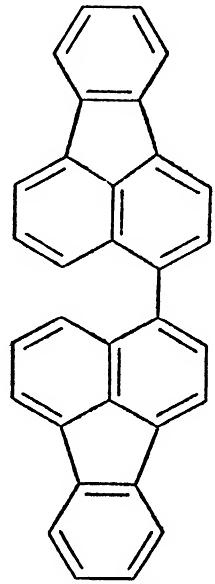
**Dibenzo-[bc,kl]-coronene**



Additional Data
Sublimation Temp. (°C)
450–500[12]

### $C_{32}H_{18}$

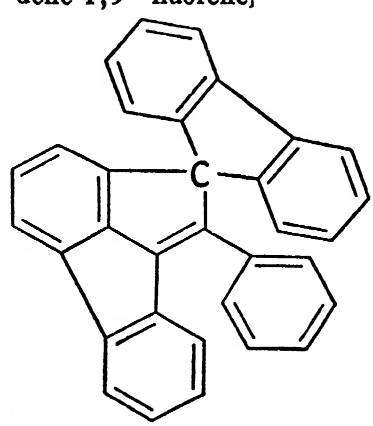
**4,4′-Bi-(1,2-benzoacenaphthyl)**



M. P., °C  327–329[22]

### $C_{33}H_{20}$

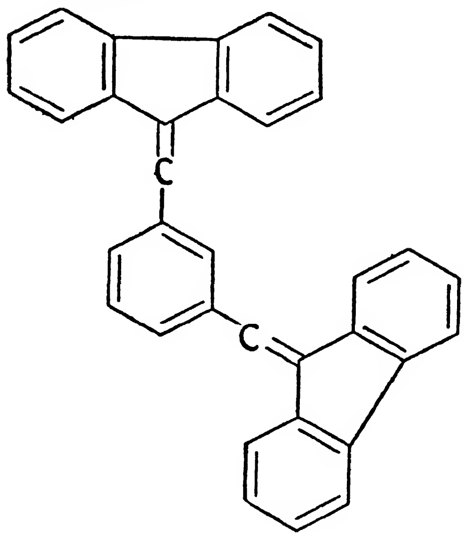
**Spiro[indo-[3′,2′,1′-cd]-2-phenylindene-1,9″-fluorene]**



M. P., °C  196–197[9]

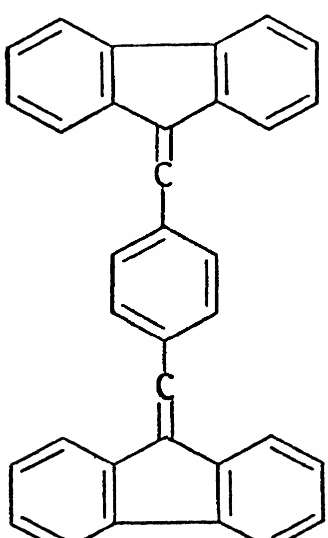
## $C_{34}H_{22}$

**1,3-Di-(9′-fluorylidenemethyl)-benzene**



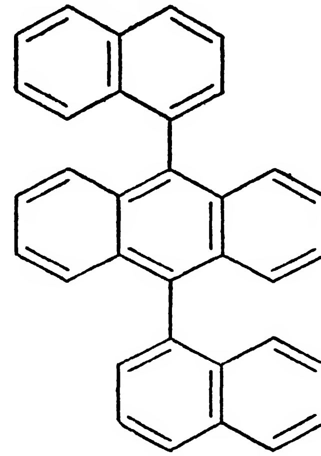
M. P., °C
178–179[16]

**1,4-Di-(9′-fluorylidenemethyl)-benzene**



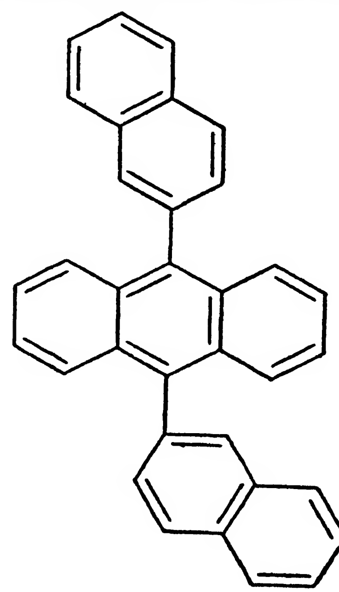
M. P., °C
209–210[15]

**9,10-Di-(1′-naphthyl)-anthracene**



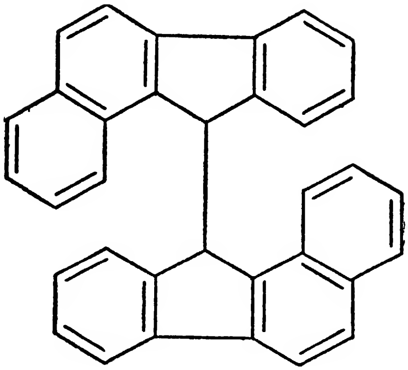
M. P., °C
430–431[24]
430[23]

**9,10-Di-(2′-naphthyl)-anthracene**



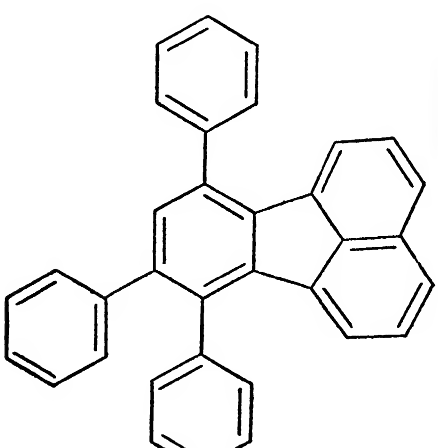
M. P., °C
379[23]
378–379[24]

**Bi-9,9′-(1,2-benzofluoryl)**



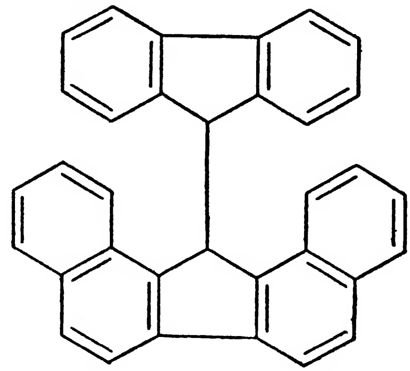
M. P., °C
257[20]
221[21]

**2,3-(2′,1′-Acenaphtho)-1,4,5-triphenylbenzene**



M. P., °C
195–196[7]

**1,2,7,8-Dibenzo-9-(9′-fluoryl)-fluorene (a)**

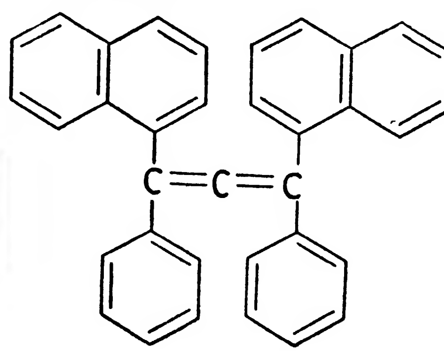


M. P., °C
270[20, 21]

(a) The structure of this compound was not clearly defined in the literature.

## $C_{35}H_{24}$

**1,3-Diphenyl-1,3-di-(1′-naphthyl)-propadiene**



M. P., °C
242–244 (a)[10, 11]
240[5]
158–159 (b) (c)[10, 11]

Additional Data
$[\alpha]^{17}_{5461} = +437°$ (b)[10, 11]
$[\alpha]^{17}_{5461} = -438°$ (c)[10, 11]

(a) This constant was determined on the *dl*-form of the compound.

(b) This constant was determined on the *d*-form of the compound.
(c) This constant was determined on the *l*-form of the compound.

---

**Di-(x,x′-phenanthryl)-phenylmethane** (a)

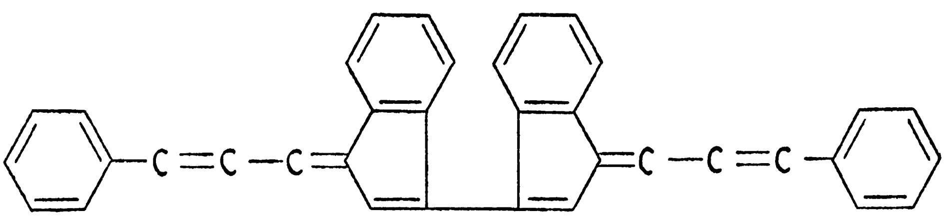
M. P., °C
165[8]

(a) The structure of this compound was not clearly defined in the literature.

---

$C_{36}H_{26}$

**Bi-3,3′-[1-(3″-phenylpropen-2″-ylidene)-indenyl]**



M. P., °C
251[19]

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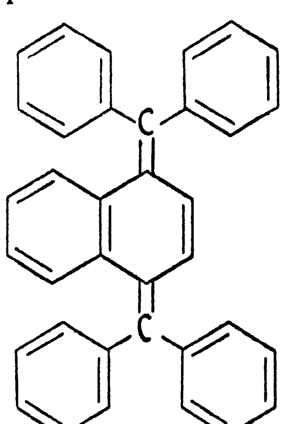
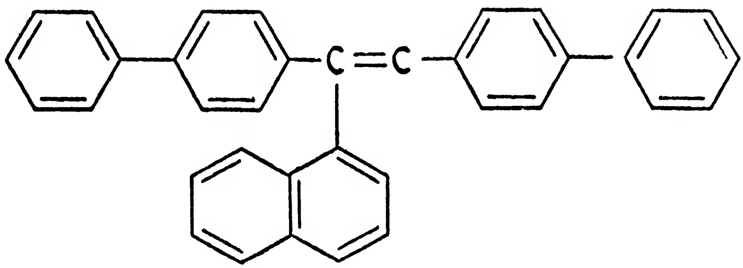
**1,4-Dibenzhydrylidene-1,4-dihydronaphthalene**



M. P., °C
262–263[17]

*This series continued on next page*

**1-(1′-Naphthyl)1,2-di-*p*-biphenylylethene**



M. P., °C
209–214[14]

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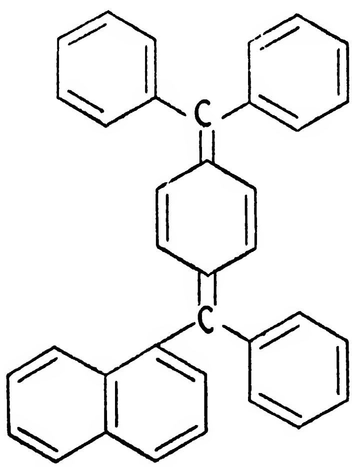
**1-Benzhydrylidene-4-(1′-naphthylphenylmethylene)-cyclohexadiene-2,5**



M. P., °C
240–241 (in carbon dioxide)[4]
238–239 (in carbon dioxide)[1]

---

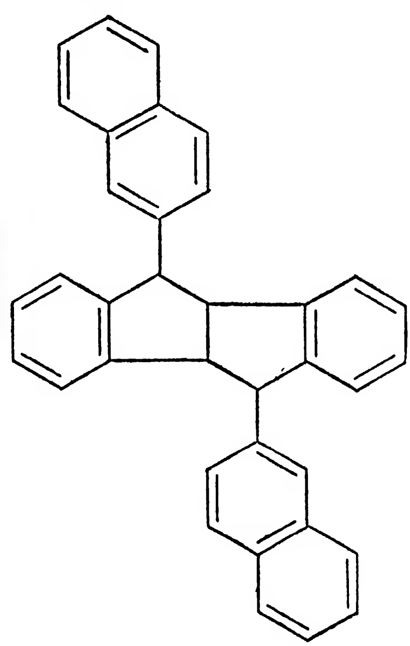
**x-Benzhydrylidene-x,x-diphenyl-x,x-benzocycloheptadiene-x,x** (a)

M. P., °C
181–182[18]

(a) The structure of this compound was not clearly defined in the literature.

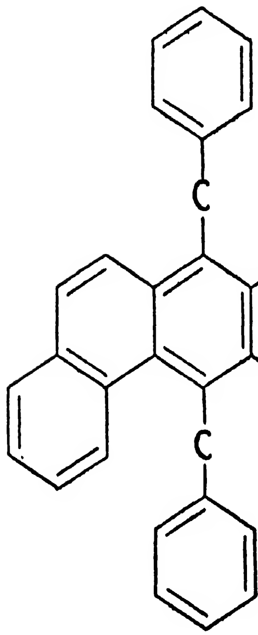
---

**2,3,6,7-Dibenzo-4,8-di-(2′-naphthyl)-bicyclo-[3,3,0]-octane**



M. P., °C
225[3]

### 1,2,5,6-Dibenzo-9,10-dibenzylanthracene



M. P., °C
195–201 (a)[6]

(a) This compound melts with decomposition.

---

### x,x,x-Triphenyl-x,x-dihydronaphthacene (a)

M. P., °C
208–209[2]

(a) The structure of this compound was not clearly defined in the literature.

*References on Polynuclear Aromatics of Empirical Formula $C_nH_{2n-46}$*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18. Staudinger, H., and H. Kon, Ann. **384,** 38 **1911.**
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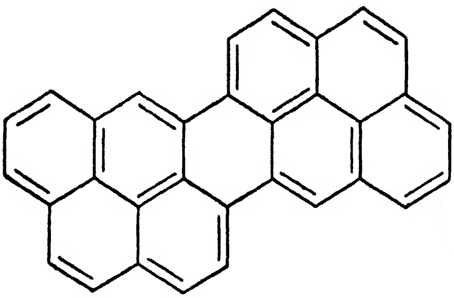
# XXII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-48}$

# XXII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-48}$

## $C_{32}H_{16}$

**Dinaphtho-[2,1,8-cde,2',1',8'-lmn]-perylene**



M. P., °C
213–214[17]

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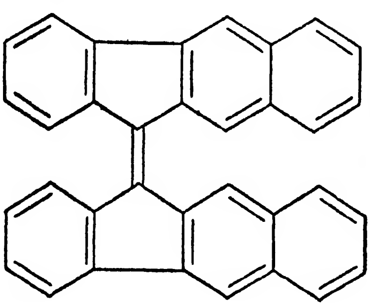
## $C_{34}H_{20}$

**9,9'-Bi-(2,3-benzofluorylidene)**



M. P., °C
232[15]

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***sym*-Di-α-naphthylenediphenylene-ethene** (a)

M. P., °C
317–318[16]

(a) The structure of this compound was not clearly defined in the literature.

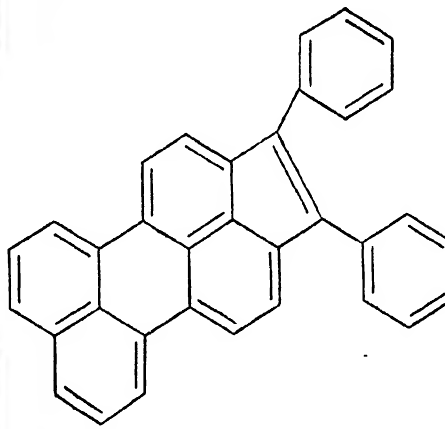
***unsym*-Di-α-naphthylenediphenylene-ethene** (a)

M. P., °C
315[16]

(a) The structure of this compound was not clearly defined in the literature.

---

**(4,5-Diphenylcyclopenten-4-o)-[cd]-perylene**



M. P., °C
315–316[21]

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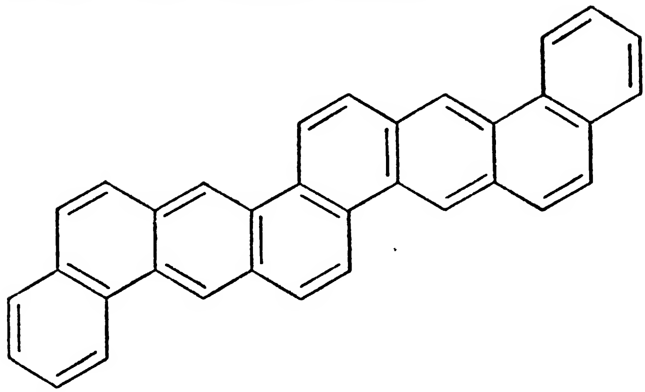
*This series continued on next page*

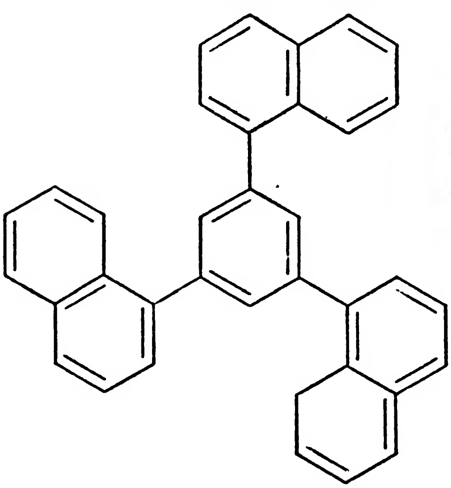
2,3,8,9-Di-(4′,3′-naphtho)-chrysene



M. P., °C
500[10]

$C_{36}H_{24}$

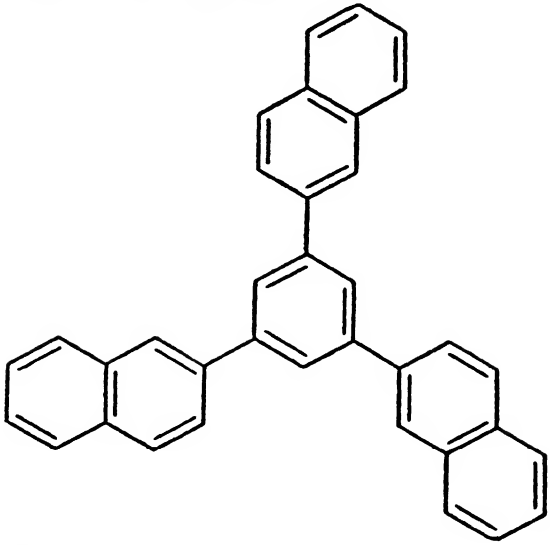
1,3,5-Tri-(1′-naphthyl)-benzene



M. P., °C
190.5–191[5]

*This series continued on next page*

**1,3,5-Tri-(2′-naphthyl)-benzene**



M. P., °C
234–235[5]

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**x,x-Di-*p*-biphenylylacenaphthylene** (a)

M. P., °C
189.5–190.5[1]

(a) The structure of this compound was not clearly defined in the literature.

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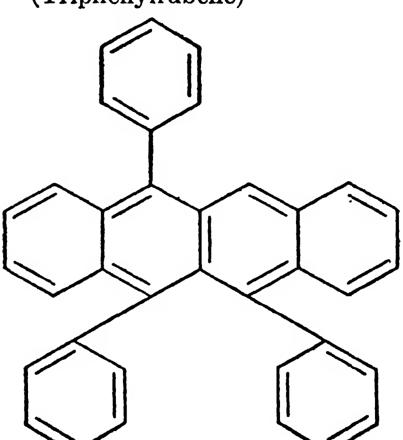
**5,6,11-Triphenylnaphthacene** (a)
(Triphenylrubene)

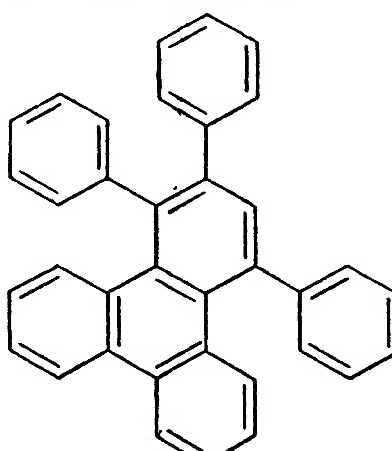


M. P., °C
236–237[3, 4, 7, 9]

(a) This compound was named Diphenylrubrene in reference 7.

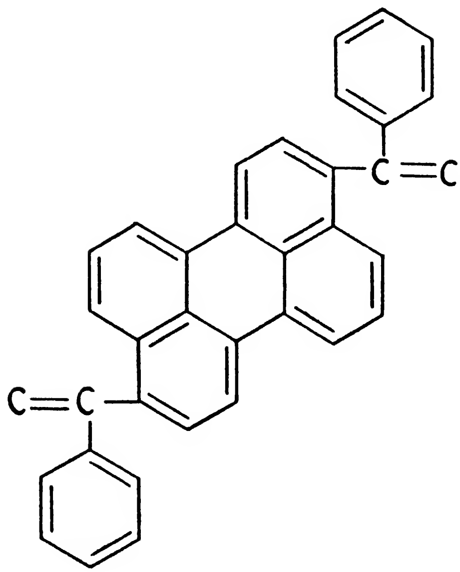
---

**1,2,4-Triphenyltriphenylene**



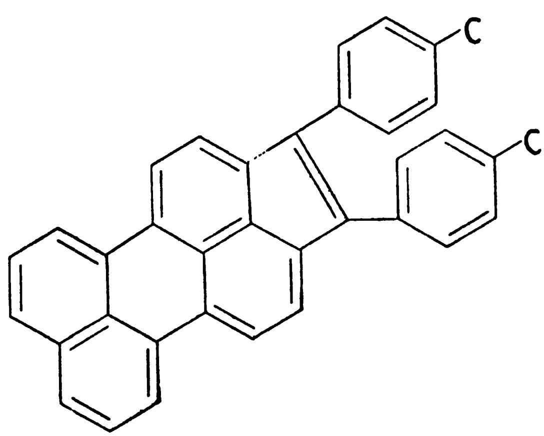
M. P., °C
250[6]

**3,9-Di-(1′-phenethenyl)-perylene**



M. P., °C
257–258[21]

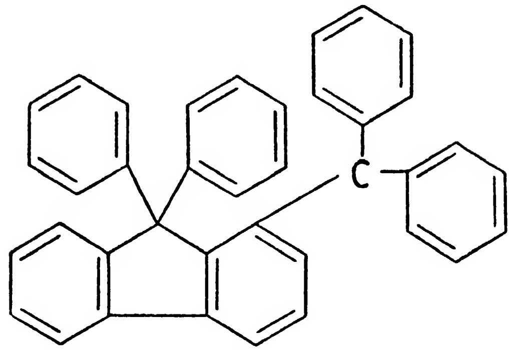
**(4,5-Di-*p*-tolylcyclopenten-4-o)-[cd]-perylene**



M. P., °C
326.5–327.5[12]

## $C_{38}H_{28}$

### 1-Benzhydryl-9,9-diphenylfluorene



M. P., °C
219–220[14]

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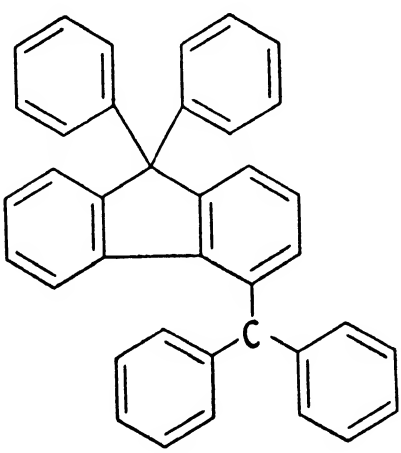
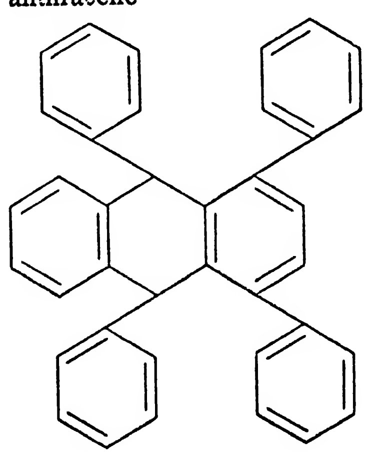
### 4-Benzhydryl-9,9-diphenylfluorene



M. P., °C
219.5–221[19]
219–220[14]

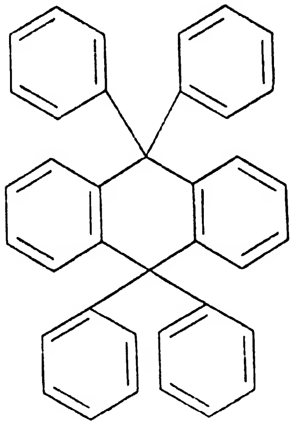
### 1,4,9,10-Tetraphenyl-9,10-dihydroanthracene



M. P., °C
217 (a)[18]
205 (a)[18]

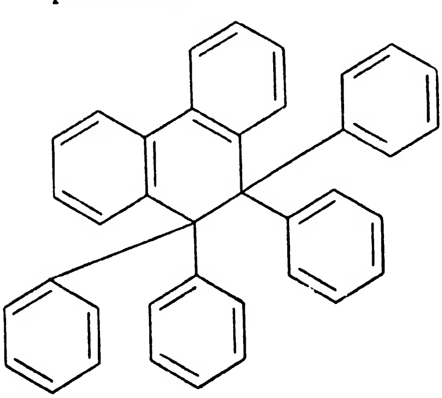
(a) These constants were determined on stereoisomers.

**9,9,10,10-Tetraphenyl-9,10-dihydroanthracene**



M. P., °C
159[13, 20]

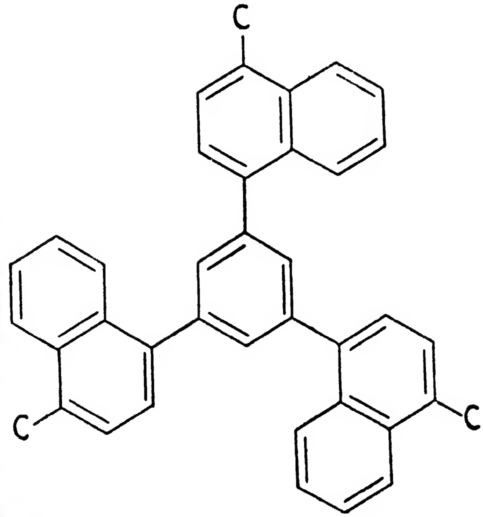
**9,9,10,10-Tetraphenyl-9,10-dihydrophenanthrene**



M. P., °C
339.5–341[19]

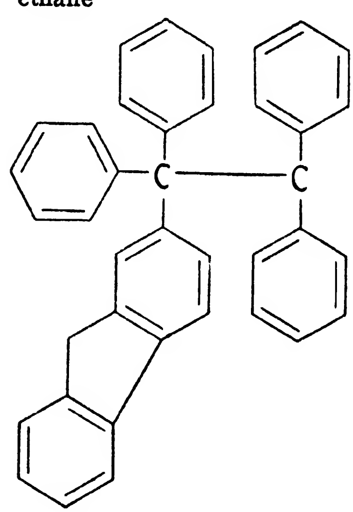
## $C_{39}H_{30}$

**1,3,5-Tri-[1′-(4′-methylnaphthyl)]-benzene**



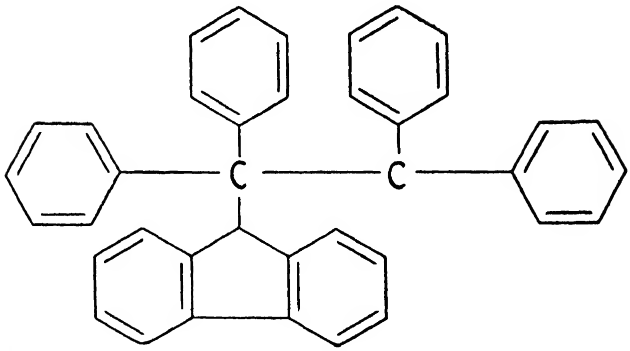

M. P., °C
185[8]

**1,1,2,2-Tetraphenyl-1-(2′-fluoryl)-ethane**




M. P., °C
187–190 (in nitrogen)[2]
168–176[2]

## 1,1,2,2-Tetraphenyl-1-(9′-fluoryl)-ethane



M. P., °C
205[11]

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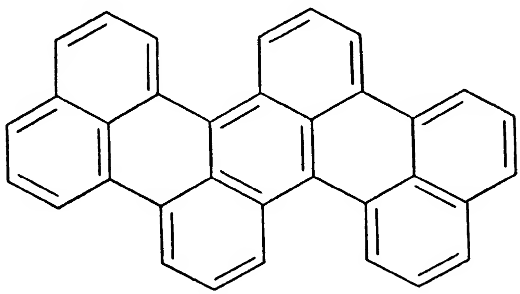
# XXIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-50}$

$C_{34}H_{18}$

**Tetrabenzo-[de,hi,op,st]-pentacene (a)**



M. P., °C
580 (in sealed tube)[8]

(a) This compound exists in solution with free valences in the 5a- and 12a-positions.

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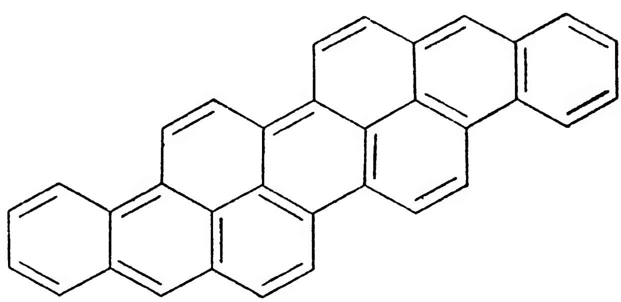
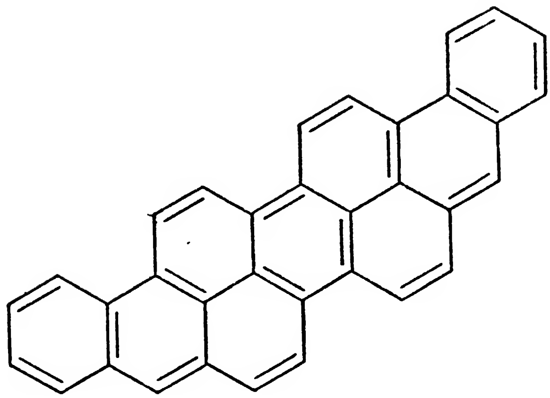
**Dinaphtho-[3,2,1-cd,3',2',1'-lm]-perylene**
(Isoviolanthrene)



M. P., °C
510[7]

Additional Data
Sublimation Temp. (°C)
460 (in carbon dioxide)[28]

**Dinaphtho-[4,3,2-cd,3′,2′,1′-lm]-perylene**
(Violanthrene)



M. P., °C
478[7]

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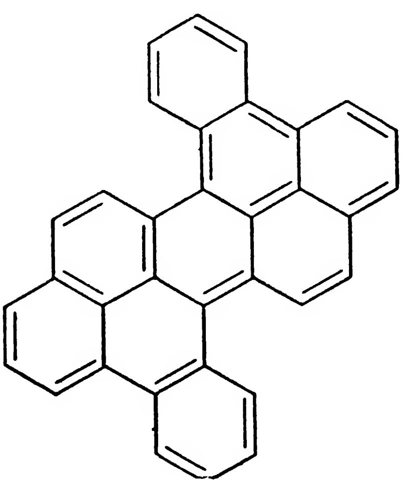
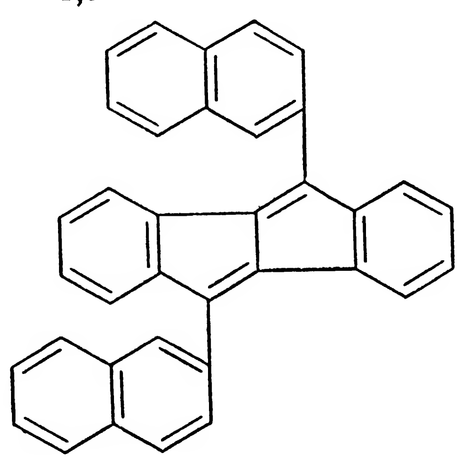
Tetrabenzo-[a,cd,j,lm]-perylene



M. P., °C
331–332[7]

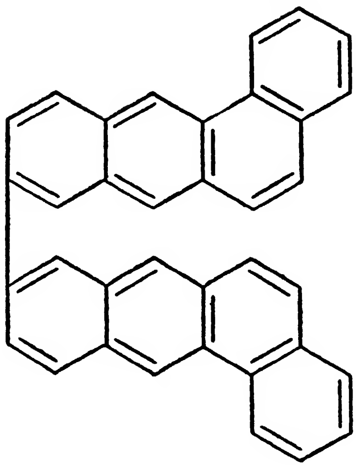
$C_{36}H_{22}$

**3,4,7,8-Dibenzo-2,6-di-(2′-naphthyl)-bicyclo-[3,3,0]-octadiene-1,5**



M. P., °C
266[6]

**6,6′-Bi-(1,2-benzoanthryl) (a)**



M. P., °C
310[10]

(a) The structure of this compound may be 7,7′-Bi-(1,2-benzoanthryl).

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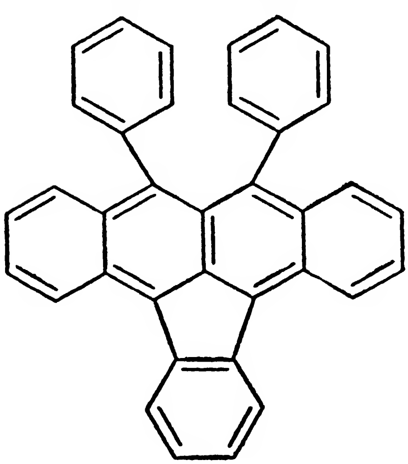
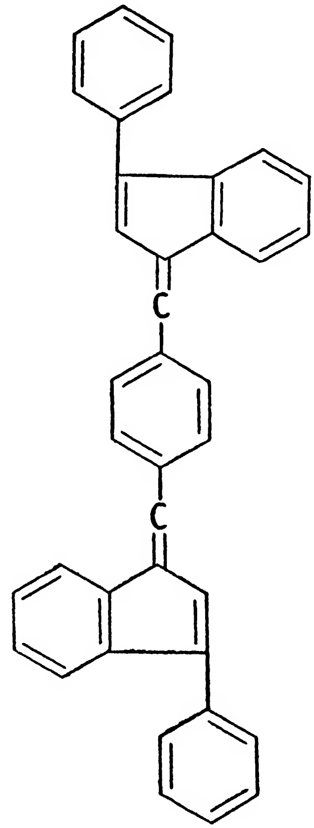
**Indo-[3′,2′,1′-fg]-11,12-diphenylnaphthacene**
(Diphenylphenylenerubene)



M. P., °C
270–271[11]

$C_{38}H_{23}$

**1,4-Di-(3′-phenylindenylidenemethyl)-benzene**




M. P., °C
231–232[15]

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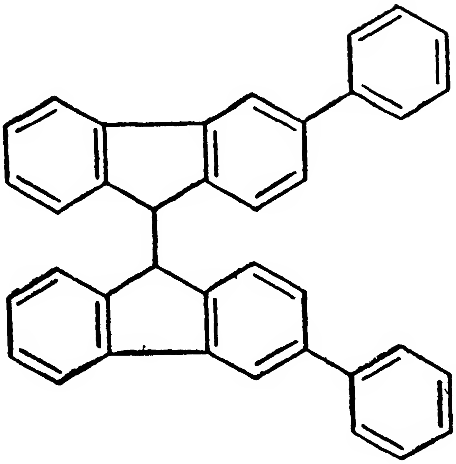
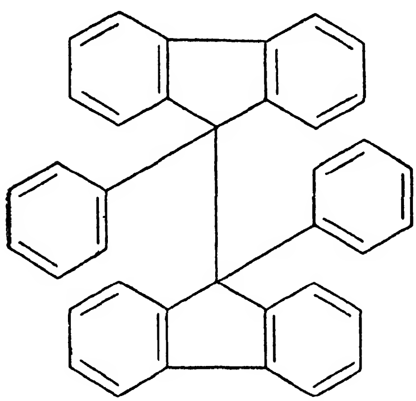
*This series continued on next page*

**9,9′-Bi-(3-phenylfluoryl)**



M. P., °C
190–193[9]

**9,9′-Bi-(9-phenylfluoryl)**



M. P., °C
256[21, 22]
254[19]
248–250[20]

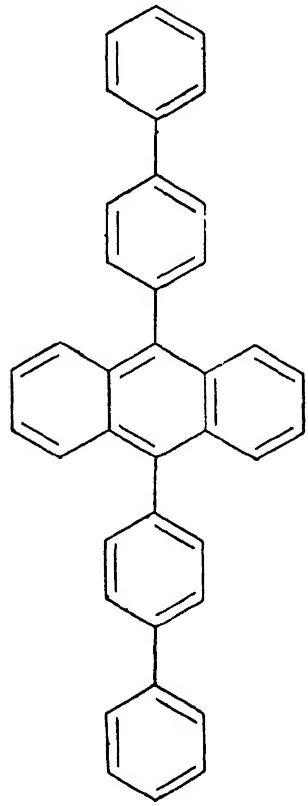
$D_4^{20}$
1.266 0° [27]

**9,9′-Bi-(x-phenylfluoryl) (a)**

M. P., °C
225[5]

(a) The structure of this compound was not clearly defined in the literature.

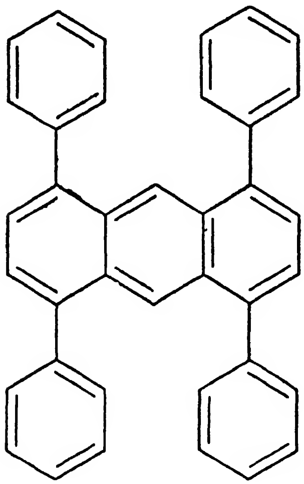
**9,10-Di-*p*-biphenylylanthracene**



M. P., °C
415[12]

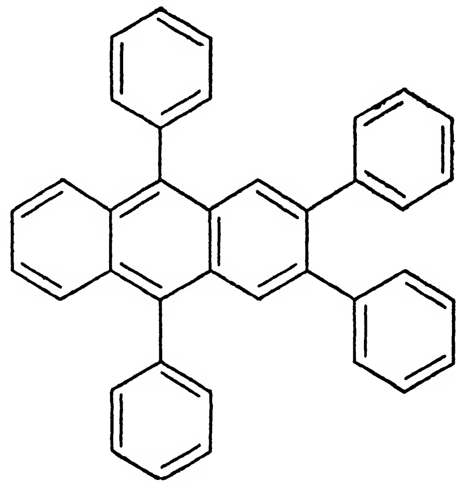
*This series continued on next page*

**1,4,5,8-Tetraphenylanthracene**



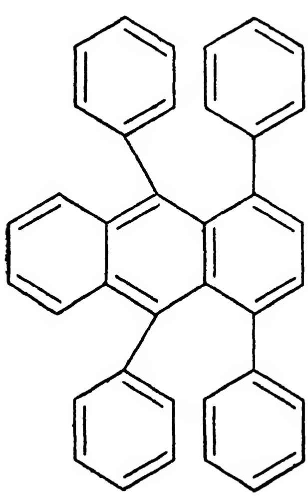
M. P., °C
370[13]

**2,3,9,10-Tetraphenylanthracene**



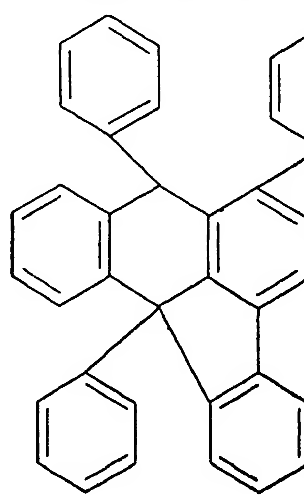
M. P., °C
324–325[1]

**1,4,9,10-Tetraphenylanthracene**



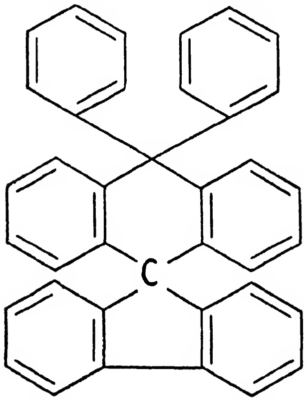
M. P., °C
205[25, 26]
204[24]

**Indo-[3′,2′,1′-de]-1,9,10-triphenyl-9,10-dihydroanthracene**



M. P., °C
322[25, 26]

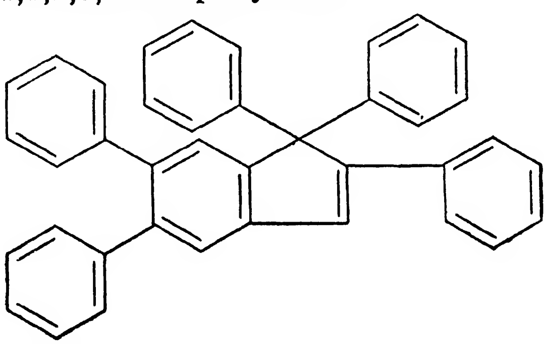
**Spiro[9,9-diphenyl-9,10-dihydro-anthracene-10,9′-fluorene]**



M. P., °C 363–364[9]

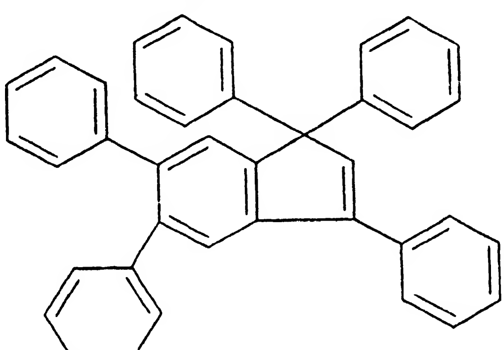
$C_{39}H_{28}$

**1,1,2,5,6-Pentaphenylindene**



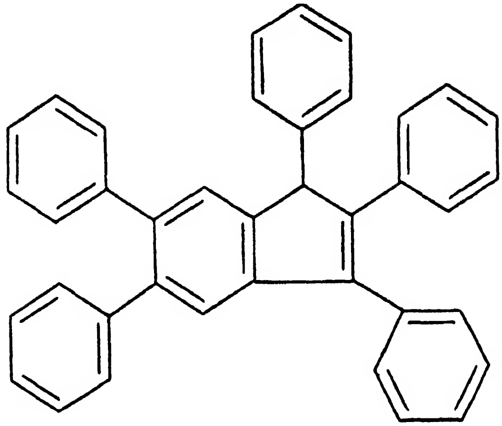
M. P., °C 222[1]

**1,1,3,5,6-Pentaphenylindene**



M. P., °C 227[1]

## 1,2,3,5,6-Pentaphenylindene



M. P., °C
280[1]

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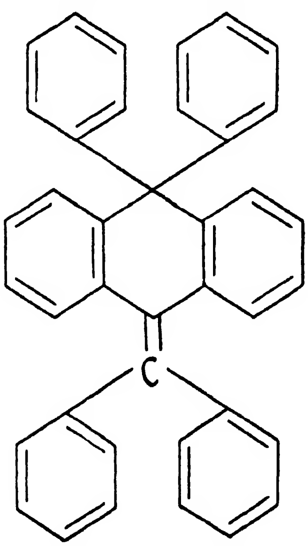
## 9,9-Diphenyl-10-benzhydrylidene-9,10-dihydroanthracene

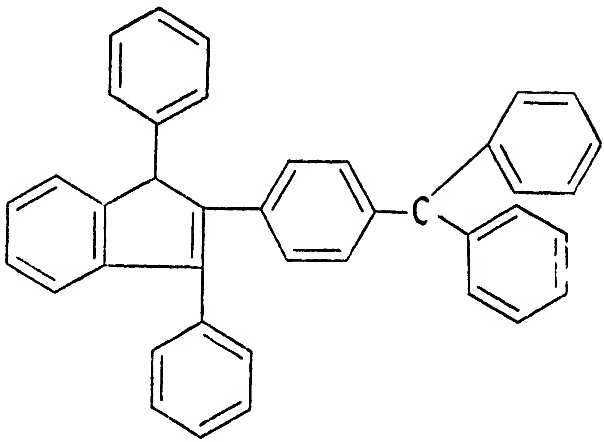


M. P., °C
286[3]
276[4]

*This series continued on next page*

## $C_{40}H_{30}$

**1,3-Diphenyl-2-(4′-benzhydryl-phenyl)-indene**



M. P., °C
173–175[14]

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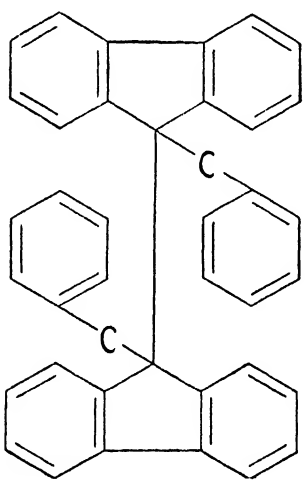
**9,9′-Bi-(9-benzylfluoryl)**



M. P., °C
203–203.5[23]
203[22]

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**x,x′-Bi-(x-*p*-tolylfluoryl) (a)**

M. P., °C
216[16]

(a) The structure of this compound was not clearly defined in the literature.

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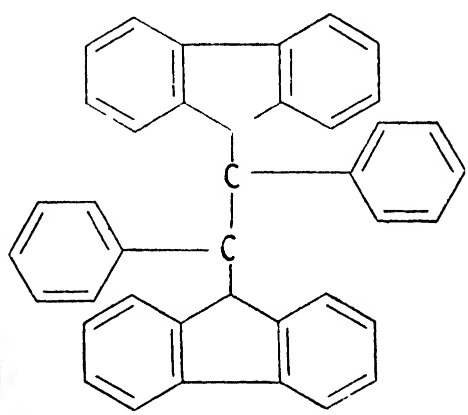
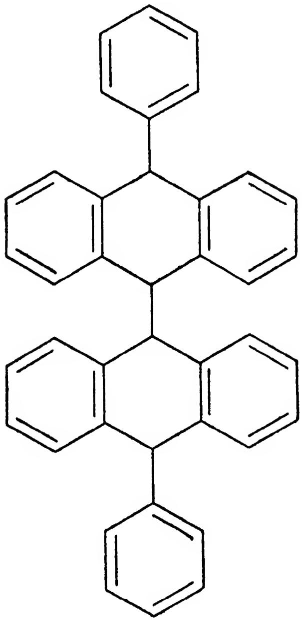
**1,2-Diphenyl-1,2-di-(9′-fluoryl)-ethane**



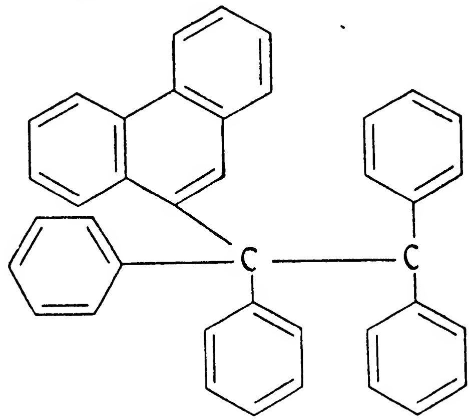
M. P., °C
321[17]

9,9′-Bi-(10-phenyl-9,10-dihydro-anthryl)



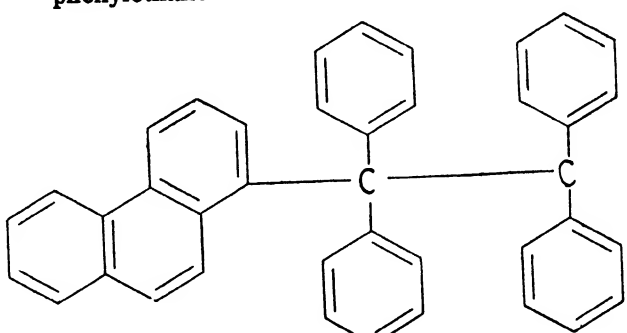
M. P., °C
260[18]

1-(9′-Phenanthryl)-1,1,2,2-tetra-phenylethane



M. P., °C
152–155 (in nitrogen)[2]
149–152 (in air)[2]

1-(1′-Phenanthryl)-1,1,2,2-tetra-phenylethane



M. P., °C
125–135 (a) (in vacuum)[2]
123–134 (a)[2]

(a) This compound melts with de-composition.

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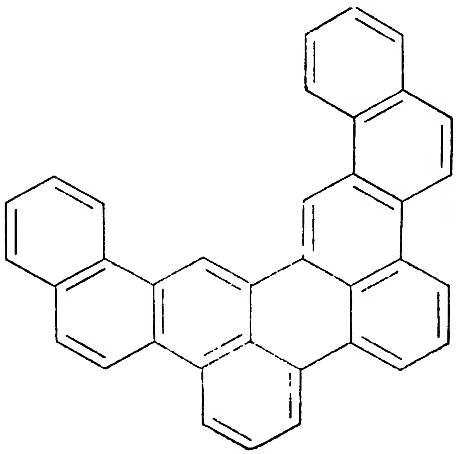
# XXIV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-52}$

## XXIV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-52}$

### $C_{36}H_{20}$

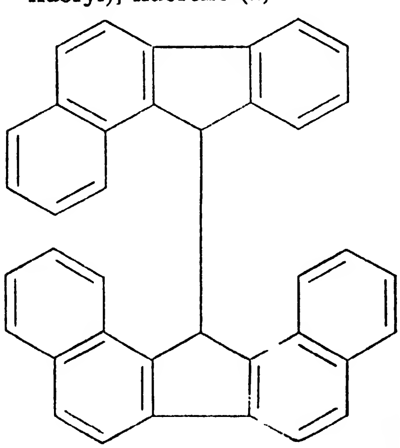
**2,3-(4',3'-Naphtho)-10,11-(2',1'-naphtho)-perylene**



M. P., °C
.240[3]

### $C_{38}H_{24}$

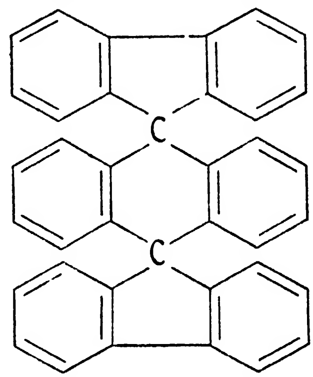
**1,2,7,8-Dibenzo-9-[9'-(1',2'-benzo-fluoryl)]-fluorene** (a)



M. P., °C
267[5, 6]

(a) The structure of this compound was not clearly defined in the literature.

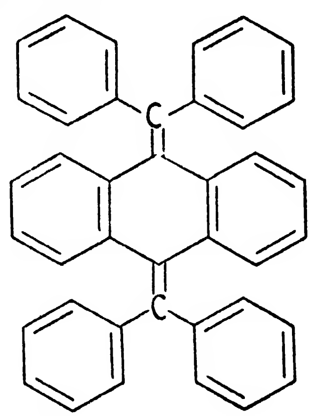
**Dispiro[fluorene-9,9'-(9',10'-dihydro-anthracene)-10',9''-fluorene]**



M. P., °C
471–474[1]

### $C_{40}H_{28}$

**9,10-Dibenzylidene-9,10-dihydro-anthracene**



M. P., °C
305[2]
302–303[4]

*References on Polynuclear Aromatics of Empirical Formula $C_nH_{2n-52}$*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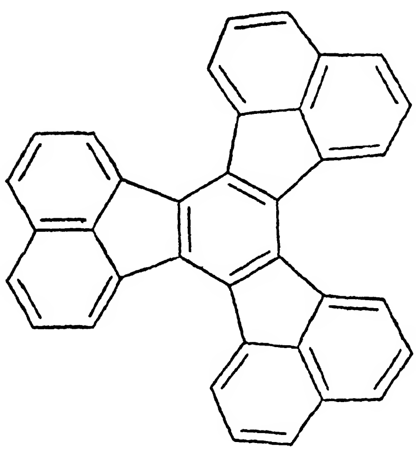
# XXV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-54}$

# XXV. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-54}$

## $C_{36}H_{18}$

**1,2,3,4,5,6-Tri-(2′,1′-acenaphtho)-benzene**
(Decacyclene)



M. P., °C
388
390[24]
389.5[16, 17]
387[9, 10, 11, 12, 13]

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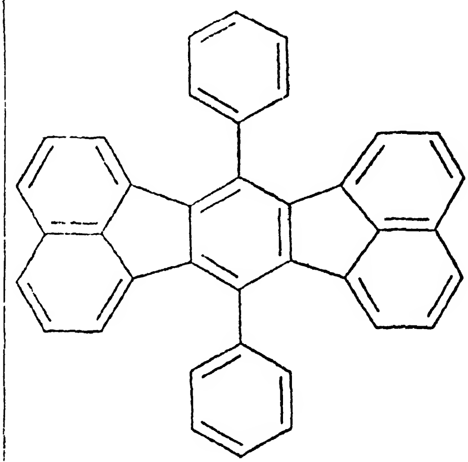
**2,3,5,6-Di-(2′,1′-acenaphtho)-1,4-diphenylbenzene**



M. P., °C
403[5]

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## $C_{38}H_{22}$

**Tri-α-naphthylenephenylene-ethene** (a)

M. P., °C
300[22]

(a) The structure of this compound was not clearly defined in the literature.

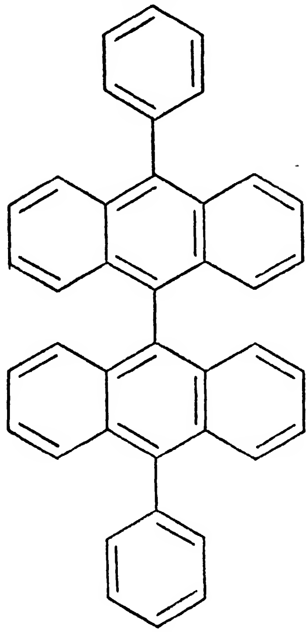
## $C_{40}H_{26}$

**Tetranaphthyl** (a)

M. P., °C
235[1]

(a) The structure of this compound was not clearly defined in the literature.

**9,9′-Bi-(10-phenylanthryl)**



M. P., °C
390–391[3]

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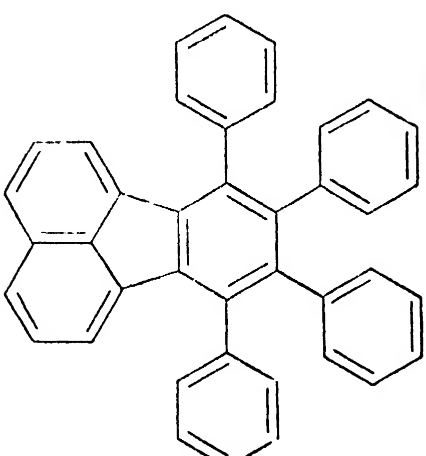
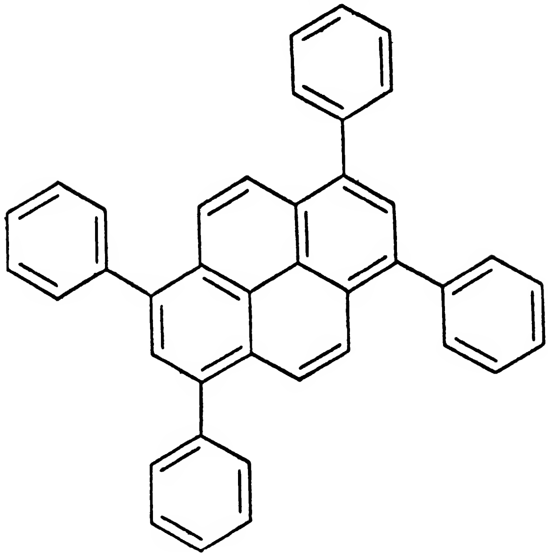
**1,2,3,4-Tetraphenyl-5,6-(2′,1′-acenaphtho)-benzene**



M. P., °C
314[5]

*This series continued on next page*

1,3,6,8-Tetraphenylpyrene



M. P., °C
299–300[23]

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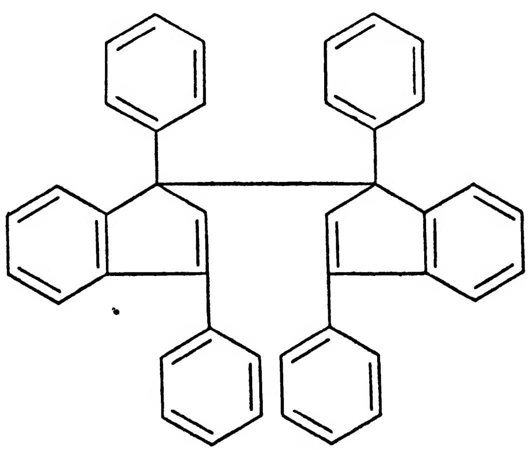
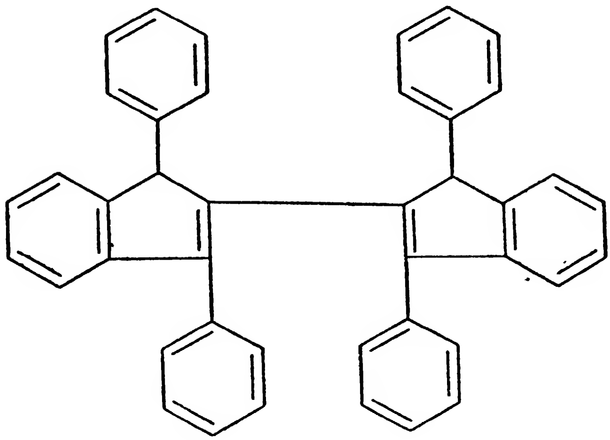
$C_{42}H_{30}$

1,1′-Bi-(1,3-diphenylindenyl)



M. P., °C
195–196[14]
190–191[15]

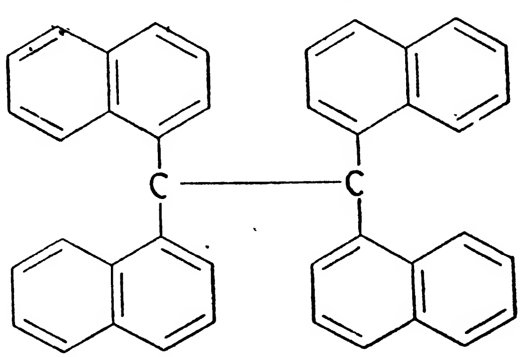
2,2′-Bi-(1,3-diphenylindenyl)



M. P., °C
249–250 (a)[7]
224–225 (a)[7]

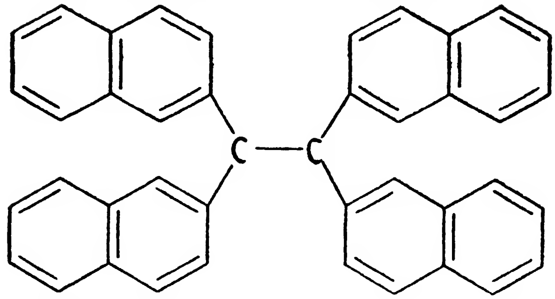
(a) These constants were determined on stereoisomers.

1,1,2,2-Tetra-(1′-naphthyl)-ethane



M. P., °C
285–286[20]
277[3, 4]
276–277[25]

**1,1,2,2-Tetra-(2′-naphthyl)-ethane**



M. P., °C
273.5[19]

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**$x_4$-Tetraphenyl-x,x-dihydronaphthacene** (a)
(Tetraphenyldihydrorubene)

M. P., °C
230–231[6]

(a) The structure of this compound was not clearly defined in the literature.

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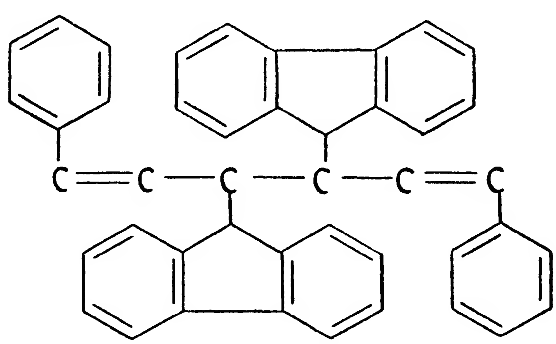
$C_{44}H_{34}$

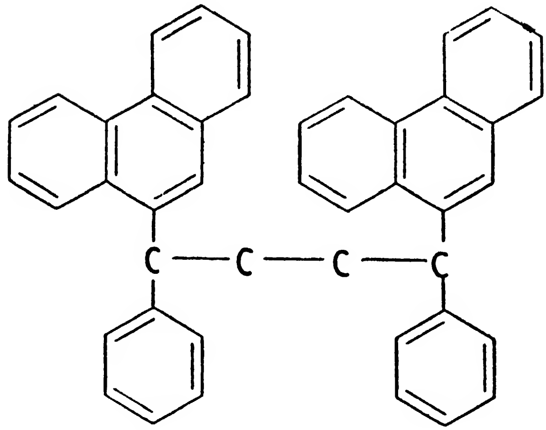
**1,6-Diphenyl-3,4-di-(9′-fluoryl)-hexadiene-1,5**



M. P., °C
204 (a)[18]
160–161 (a)[21]

(a) These constants were determined on isomeric forms.

# 1,4-Diphenyl-1,4-di-(9′-phenanthryl)-butane



M.P., °C
243.5[2]


*References on Polynuclear Aromatics of Empirical Formula $C_nH_{2n-54}$*

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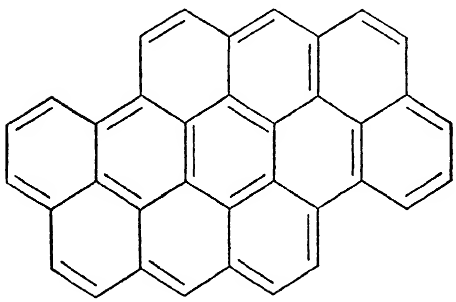
# XXVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-56}$

## XXVI. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-56}$

### $C_{36}H_{16}$

**Dinaphtho-[2,1,8-bcd,2′,1′,8′-klm]-coronene**



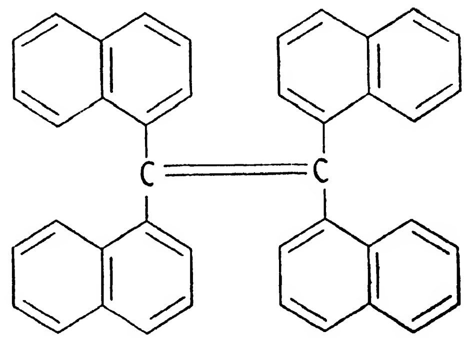
Additional Data

Sublimation Temp. (°C)

ca 500 1 mm[18]

### $C_{42}H_{28}$

**1,1,2,2-Tetra-(1′-naphthyl)-ethene**

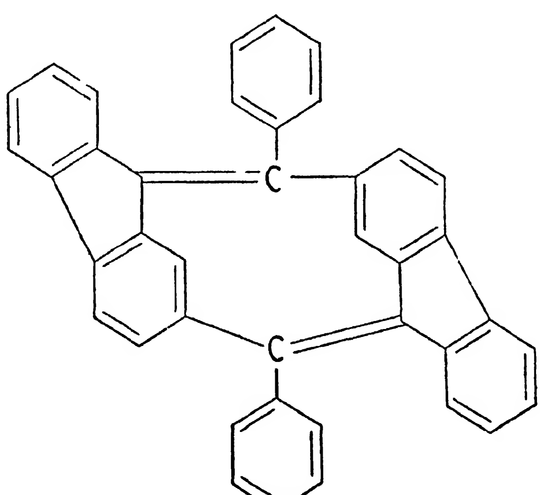


M. P., °C

322[3, 13]

### $C_{40}H_{24}$

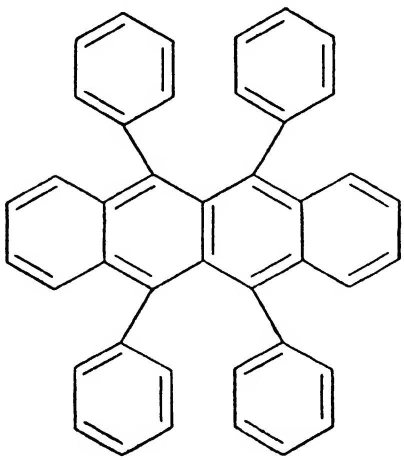
**Difluoro-[2′,1′,9′-abc,2″,1″,9″-fgh]-5,10-diphenylcyclodec-adiene-4,9**



M. P., °C

225[11]

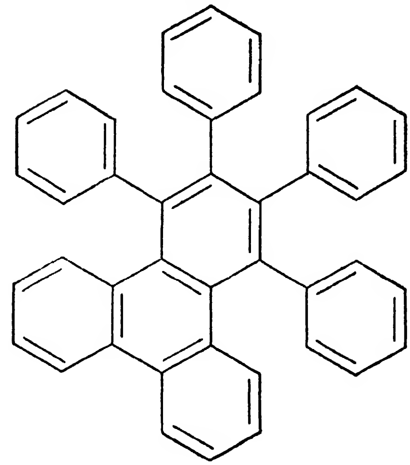
**5,6,11,12-Tetraphenylnaphthacene**
(Rubrene) (a)
(Tetraphenylrubene)



M. P., °C
**333**
335[1, 9]
334[7, 9]
332[20]
331[12, 14, 16]
330[2]

(a) This compound was thought by some investigators to be 2,2′-Bi-(1,3-diphenyl-4,5-benzocyclopentadien-3,5-ylidene). However, later work indicates that the above structure is correct.

**1,2,3,4-Tetraphenyltriphenylene**



M. P., °C
292–293[4]

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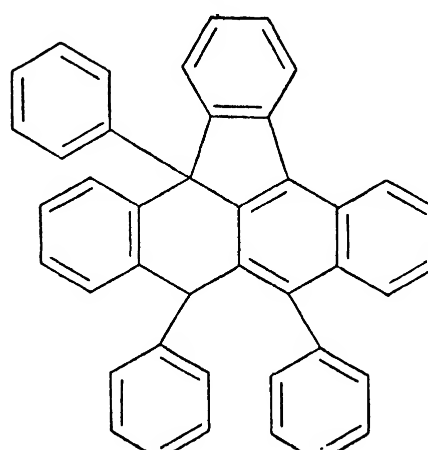
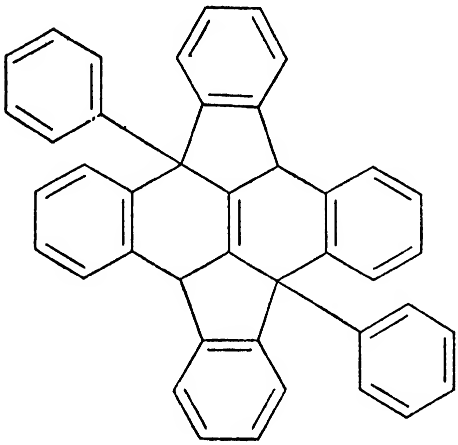
**Indo-[1′,2′,3′-op]-5,6,11-triphenyl-6,11-dihydronaphthacene**
(Pseudorubrene)



M. P., °C
278[1, 9]
210 (a)[16]

(a) This compound remelts at 278.

**Diindano-[3′,2′,1′-fg,3″,2″,1″-op]-5,11-diphenyl-5,6,10,11-tetrahydronaphthacene**

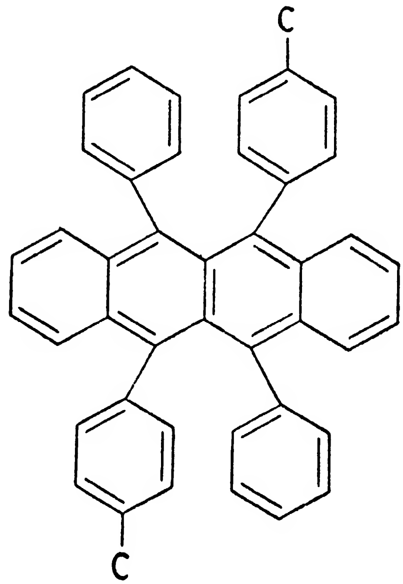


M. P., °C
338 (a)[1]
302 (a)[1]

(a) These constants were determined on stereoisomers.

$C_{42}H_{28}$

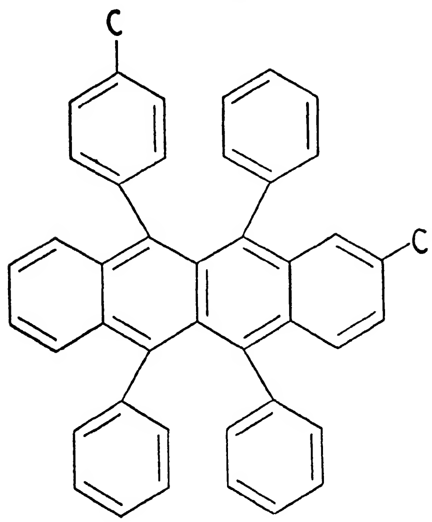
**5,11-Diphenyl-6,12-di-*p*-tolylnaphthacene**
(Bis-*p*-tolyl-diphenylrubene)
(Dimethylrubrene)




M. P., °C
205[5]

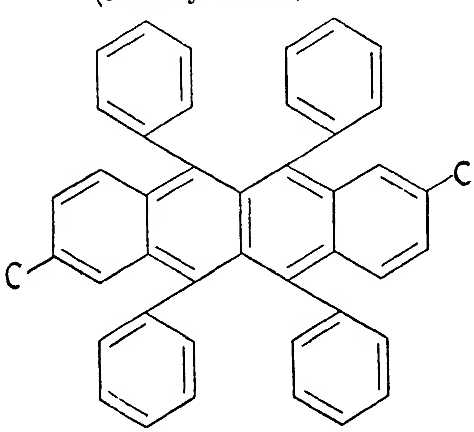
*This series continued on next page*

**2-Methyl-5,6,12-triphenyl-11-*p*-tolylnaphthacene**
(Dimethylrubrene)



M. P., °C 273[5]

**2,8-Dimethyl-5,6,11,12-tetraphenylnaphthacene**
(Dimethylrubrene)



M. P., °C
321[5]
315 (a)[17, 19]

(a) The structure of this compound was not clearly defined in the literature.

**Pseudobis-(*p*-tolyl)-diphenylnaphthacene** (a)

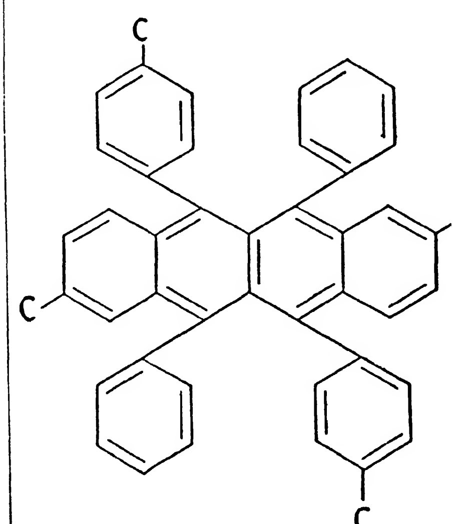
M. P., °C
294–295 (b)[9]
293–294 (b)[10]
271–272 (b)[9, 10]

(a) The structure of this compound was not clearly defined in the literature.

(b) There constants were determined on isomeric forms.

$C_{46}H_{36}$

**2,8-Dimethyl-5,11-di-*p*-tolyl-6,12-diphenylnaphthacene**
(Dimethyldiphenylditolylrubene)



M. P., °C
242[6]

## $C_{48}H_{40}$

**$x_{12}$-Dodecahydrofluorocyclene** (a)

M. P., °C
326[8]

(a) The structure of this compound was not clearly defined in the literature.

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*References on Polynuclear Aromatics of Empirical Formula* $C_nH_{2n-56}$


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2. Bowen, E. J., and F. Steadman, J. Chem. Soc. **1934,** 1098
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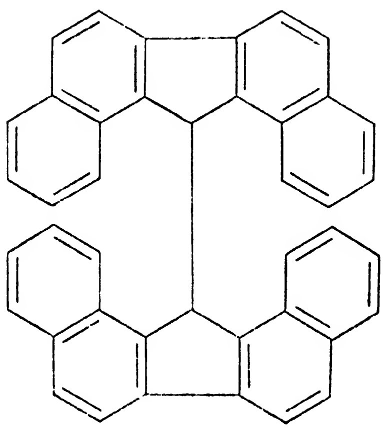
# XXVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-58}$

# XXVII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-58}$

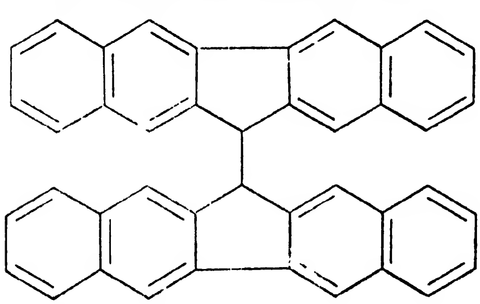
## $C_{42}H_{26}$

**9,9′-Bi-(1,2,7,8-dibenzofluoryl)**



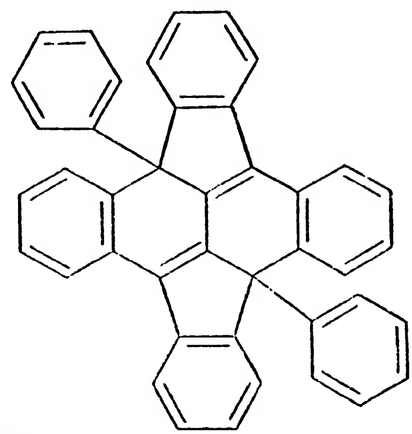
M. P., °C
353–355[7, 8]

**9,9′-Bi-(2,3,6,7-dibenzofluoryl)**



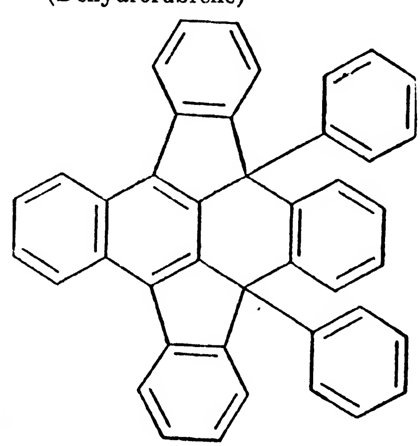
M. P., °C
310[3]

**Diindo-[1′,2′,3′-fg,1″,2″,3″-op]-5,11-diphenyl-5,11-dihydronaphthacene**
(Dehydrorubrene)



M. P., °C
455[2]

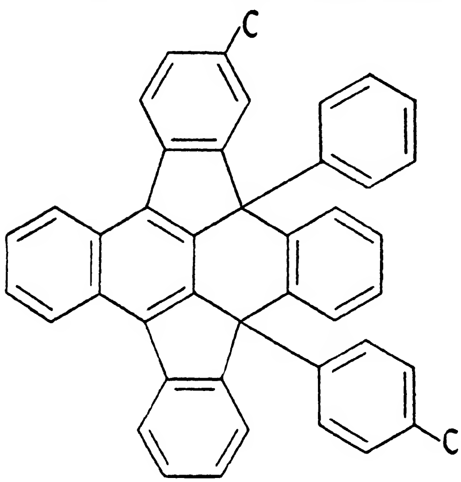
**Diindo-[1′,2′,3′-fg,3″,2″,1″-op]-5,12-diphenyl-5,12-dihydronaphthacene**
(Dehydrorubrene)



M. P., °C
430[5]
427–428[4]

## $C_{44}H_{30}$

**Indo-[1′,2′,3′-fg]-(6″-methylindo)-[3″,2″,1″-op]-5-p-tolyl-12-phenyl-5,12-dihydronaphthacene**

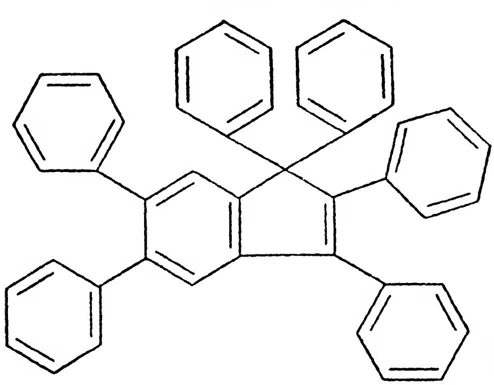


M. P., °C
340 (a)[5]

(a) This compound remelts at 370.

## $C_{45}H_{32}$

**1,1,2,3,5,6-Hexaphenylindene**



M. P., °C

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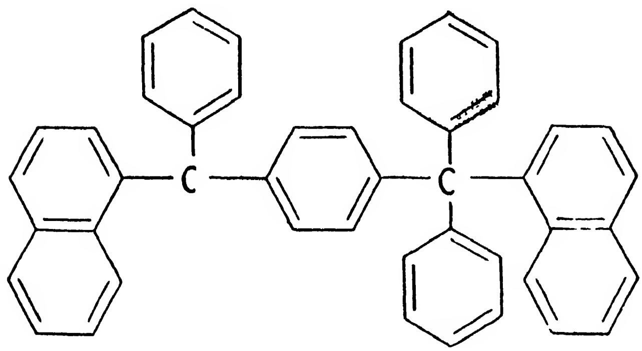
## $C_{46}H_{34}$

**1-(1′-Naphthylphenylmethyl)-4-(1′-naphthyldiphenylmethyl)-benzene (a)**



M. P., °C
234–235[6]

(a) The structure of this compound was not clearly defined in the literature.

*References on Polynuclear Aromatics of Empirical Formula* $C_nH_{2n-58}$

1. Allen, C. F. H., and J. W. Gates, Jr., J. Am. Chem. Soc. **65**, 2129 **1943**.
2. Badoche, M., Ann. chim. [10] **20**, 200 **1933**.
3. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944**, 553.
4. Dufraisse, C., and L. Velluz, Bull. soc. chim. [5] **3**, 1905 **1936**.
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7. Vansheidt, A., Ber. **59**, 2092 **1926**.
8. Vansheidt, A. A., J. Russ. Phys. Chem. Soc. **58**, 69 **1926**; C. A. **21**, 581 **1927**; Chem. Zentr. **1926**, II, 2428.

M. P., °C
430[5]
427–428[4]

*This series continued on next page*

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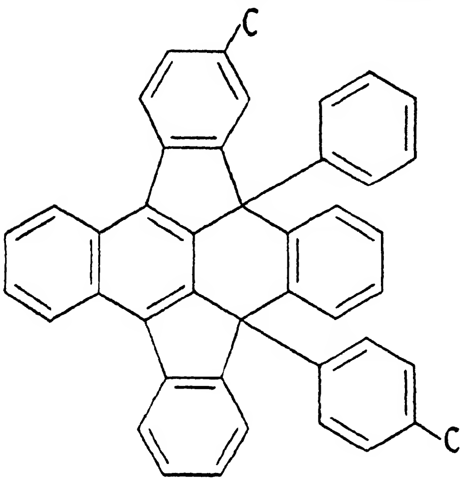
$C_{44}H_{30}$

**Indo-[1′,2′,3′-fg]-(6″-methylindo)-[3″,2″,1″-op]-5-p-tolyl-12-phenyl-5,12-dihydronaphthacene**



M. P., °C
340 (a)[5]

(a) This compound remelts at 370.

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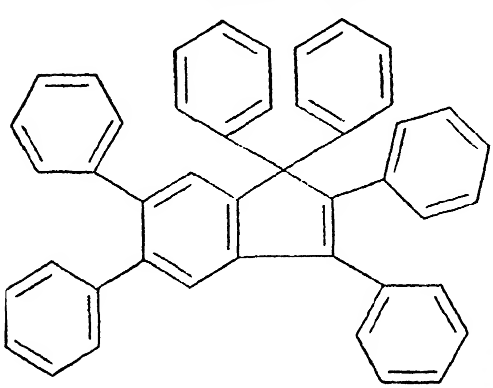
$C_{45}H_{32}$

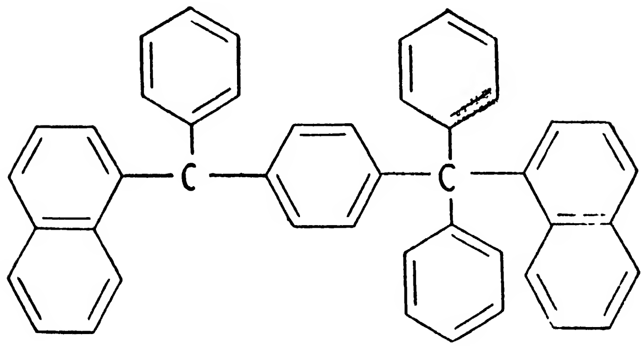
**1,1,2,3,5,6-Hexaphenylindene**



M. P., °C

## $C_{46}H_{34}$

**1-(1'-Naphthylphenylmethyl)-4-(1'-naphthyldiphenylmethyl)-benzene (a)**



M. P., °C
234–235[6]

(a) The structure of this compound was not clearly defined in the literature.

*References on Polynuclear Aromatics of Empirical Formula* $C_nH_{2n-58}$

1. Allen, C. F. H., and J. W. Gates, Jr., J. Am. Chem. Soc. **65**, 2129 **1943**.
2. Badoche, M., Ann. chim. [10] **20**, 200 **1933**.
3. Cook, J. W., and R. W. G. Preston, J. Chem. Soc. **1944**, 553.
4. Dufraisse, C., and L. Velluz, Bull. soc. chim. [5] **3**, 1905 **1936**.
5. Enderlin, L., Ann. chim. [11] **10**, 5 **1938**.
6. Gomberg, M., and C. S. Schoepfle, J. Am. Chem. Soc. **41**, 1655 **1919**.
7. Vansheidt, A., Ber. **59**, 2092 **1926**.
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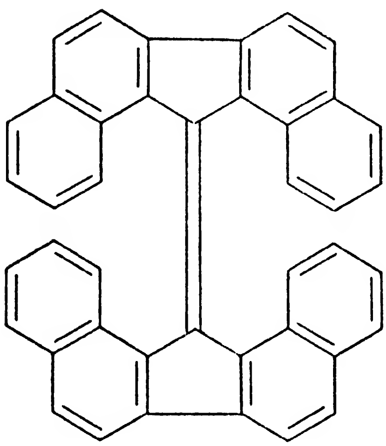
# XXVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-60 \text{ to } 88}$

## XXVIII. POLYNUCLEAR AROMATICS OF EMPIRICAL FORMULA $C_nH_{2n-60 \text{ to } 88}$

### $C_nH_{2n-60}$

### $C_{42}H_{24}$

**9,9′-Bi-(1,2,7,8-dibenzofluorylidene)** (a)



M. P., °C

357[24]

308–310[18, 19]

(a) The structure of this compound was not clearly defined in the literature.

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### $C_{48}H_{36}$

**$x_8$-Octahydrofluorocyclene** (a)

M. P., °C

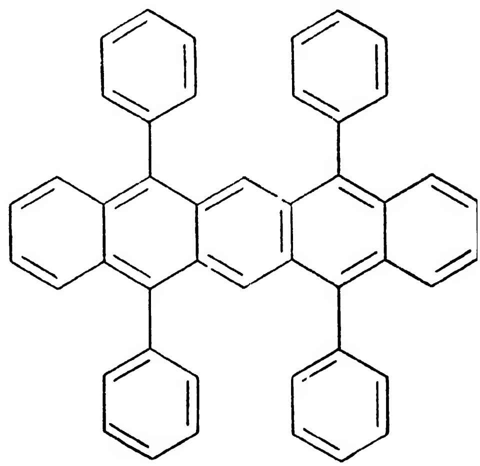
336–337[9]

(a) The structure of this compound was not clearly defined in the literature.

### $C_nH_{2n-62}$

### $C_{46}H_{30}$

**5,7,12,14-Tetraphenylpentacene**



M. P., °C

306–308[1]

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### $C_nH_{2n-64}$

### $C_{48}H_{32}$

**$x_4$-Tetrahydrofluorocyclene** (a)

M. P., °C

348–349[9]

(a) The structure of this compound was not clearly defined in the literature.

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### $C_{49}H_{34}$

**1,3-Diphenyl-9-(x′,x′,x′-triphenylphenyl)-fluorene** (a)

M. P., °C

221[15]

(a) The structure of this compound was not clearly defined in the literature.

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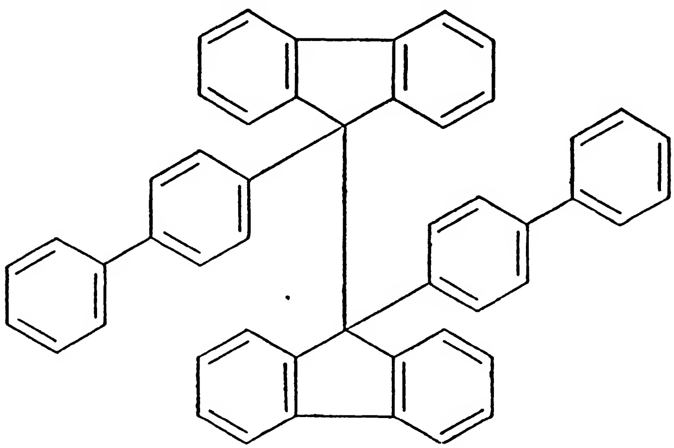
$C_nH_{2n-66}$

$C_{50}H_{34}$

9,9'-Bi-(9-*p*-biphenylylfluoryl)



M. P., °C
175–176[23]

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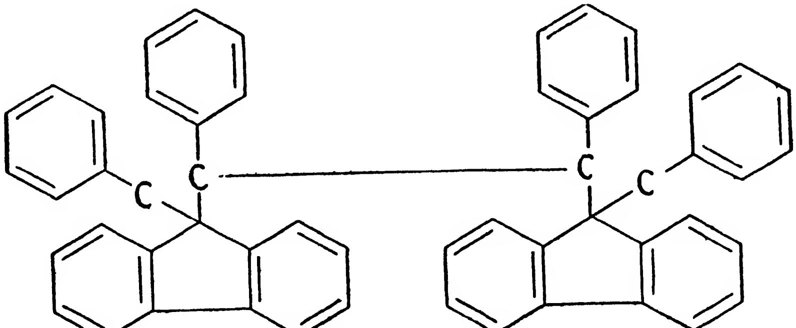
$C_{54}H_{42}$

1,2-Diphenyl-1,2-di-[9'-(9'-benzylfluoryl)]-ethane

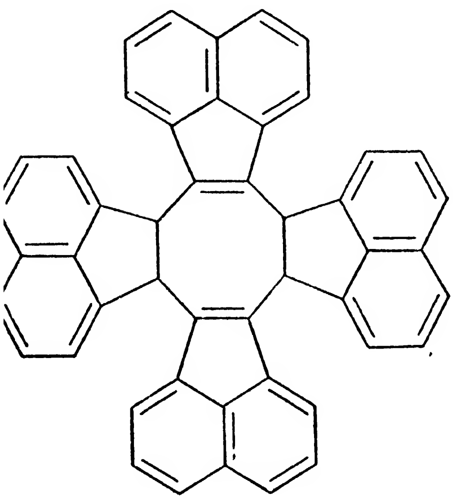



M. P., °C
304–306[22]

## $C_nH_{2n-68}$

### $C_{48}H_{28}$

**1,2,3,4,5,6,7,8-Tetra-(2′,1′-acenaphtheno)-cyclooctadiene-1,5** (a)
(Fluorocyclene)

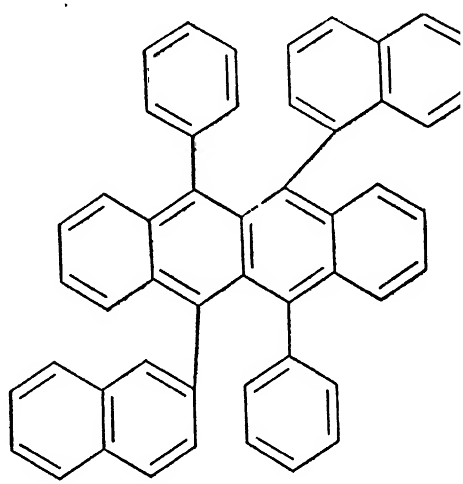


M. P., °C
396–397[9, 12]
395–396[10]

(a) The double bonds may be in the 2- and 6-positions.

### $C_{50}H_{32}$

**5,11-Diphenyl-6,12-di-(2′-naphthyl)-naphthacene** (a)



M. P., °C
280[20, 25]

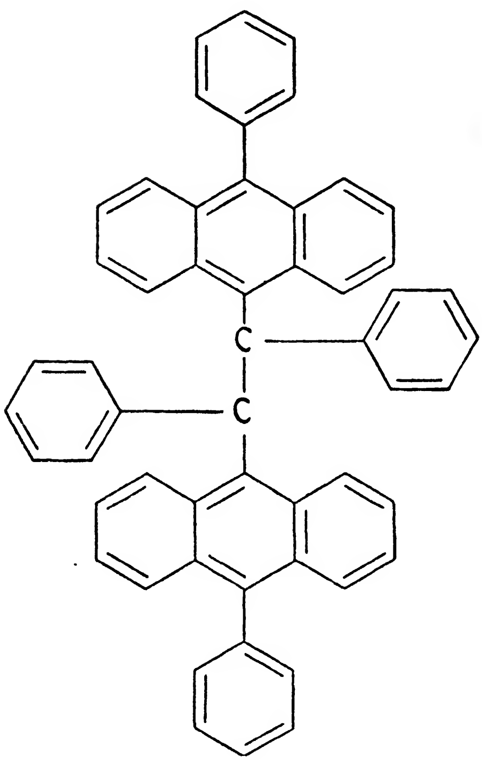
(a) This compound was named Dibenzorubrene in the literature.

*This series continued on next page*

$C_nH_{2n-70}$

$C_{54}H_{38}$

**1,2-Diphenyl-1,2-di-[9′-(10′-phenyl-anthryl)]-ethane** (a)

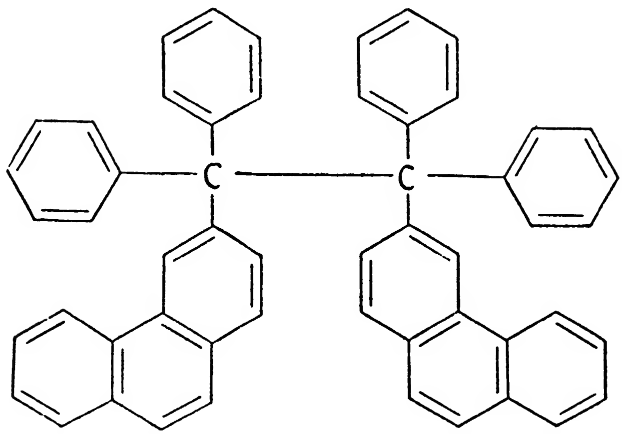


M. P., °C
252–253[14]

(a) The structure of this compound was not clearly defined in the literature.

*This series continued on next page*

**1,1,2,2-Tetraphenyl-1,2-di-(3′-phenanthryl)-ethane**



M. P., °C
150–152 (a) (in nitrogen)[3]

(a) This compound melts with decomposition.

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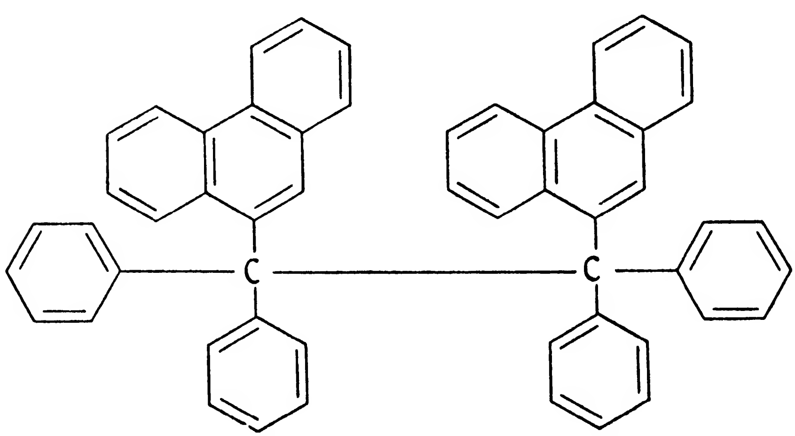
**1,1,2,2-Tetraphenyl-1,2-di-(9′-phenanthryl)-ethane**



M. P., °C
223–225 (in nitrogen)[21]
210–212[21]

$C_{55}H_{40}$

**Di-[x-(x'-fluorylmethylfluoryl)]-methane** (a)

M. P., °C
246–247[11]

(a) The structure of this compound was not clearly defined in the literature.

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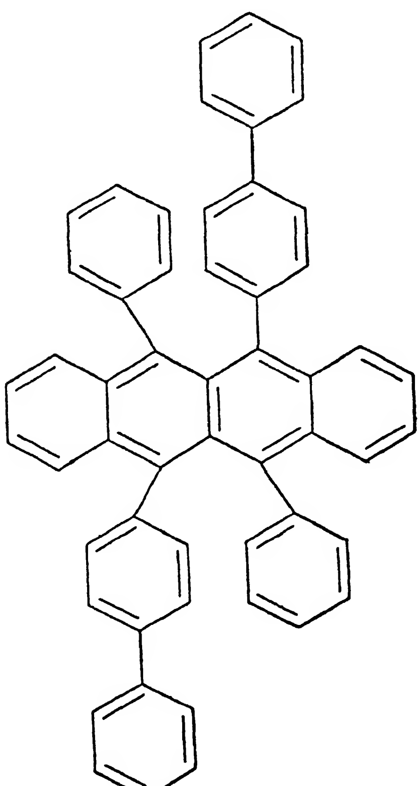
$C_nH_{2n-72}$

$C_{54}H_{36}$

**5,11-Diphenyl-6,12-di-*p*-biphenylyl-naphthacene**

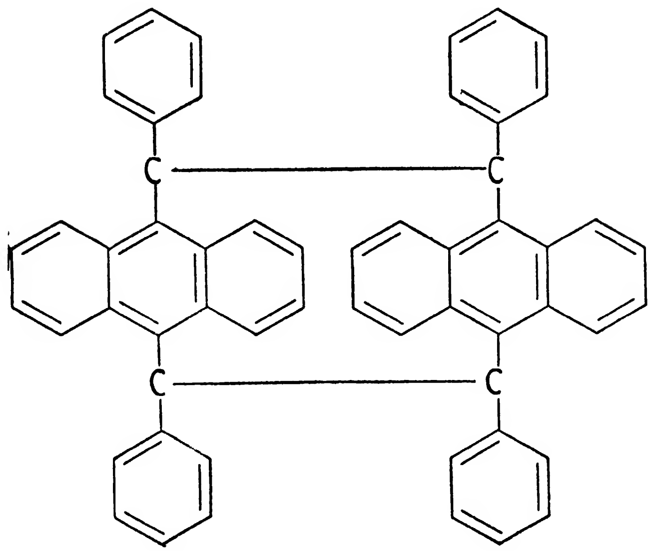


M. P., °C
317[4]

*This series continued on next page*

## $C_{56}H_{40}$

**1,2,3,4-Tetraphenyl-1,2,3,4-diendo-(9′,10′-anthracene)-cyclobutane**



M. P., °C
184[16, 17]

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## $C_nH_{2n-74}$

## $C_{50}H_{38}$

**x,x-Di-[x′-(phenanthryl)-phenyl-methyl]-phenanthrene** (a)

M. P., °C
195–197[13]

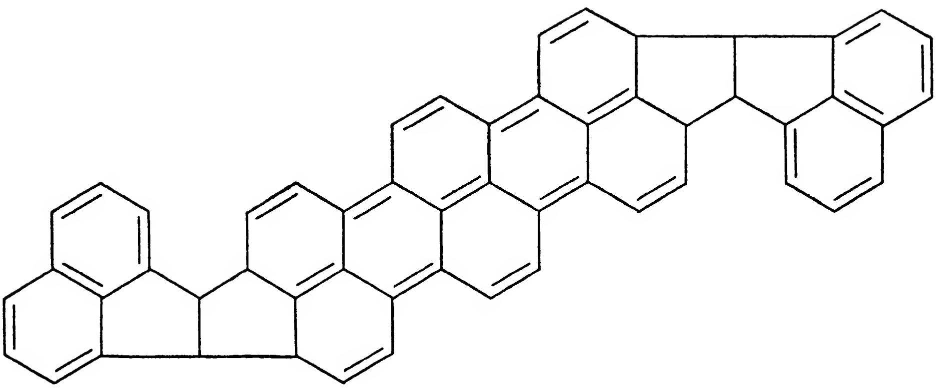
(a) The structure of this compound was not clearly defined in the literature.

*This series continued on next page*

$C_nH_{2n-76}$

$C_{54}H_{32}$

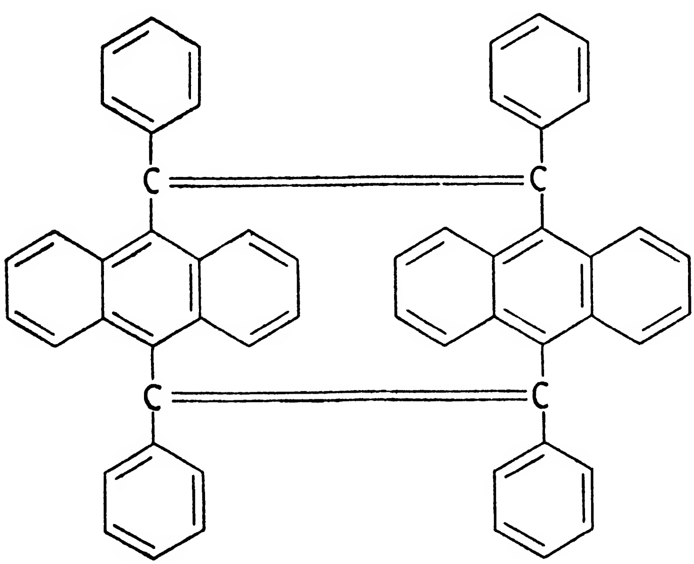
**Leucacene**



M. P., °C
250–252[5, 6]

$C_{56}H_{36}$

**1,2,3,4-Tetraphenyl-1,4,2,3-diendo-(9′,10′-anthracene)-cyclobutadiene-1,3**

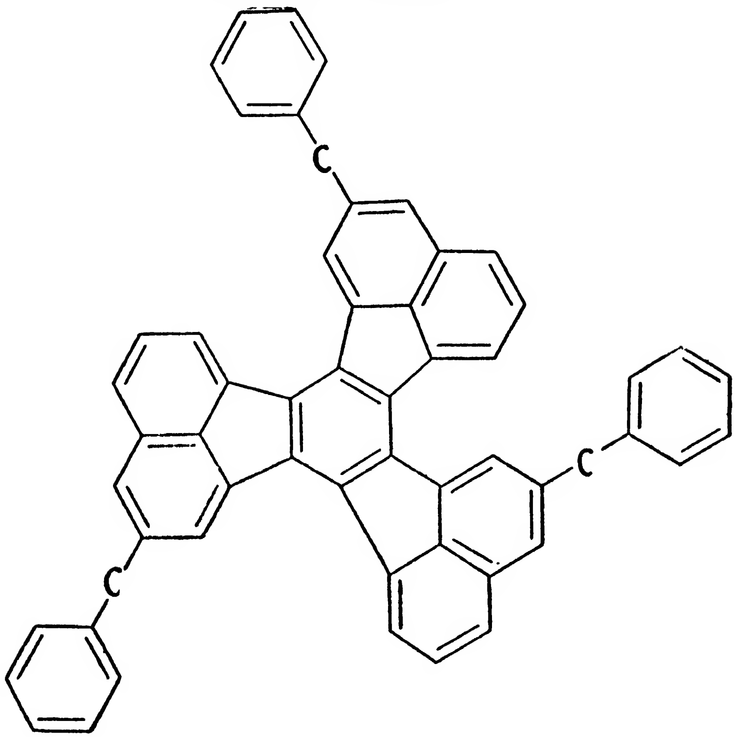


M. P., °C
197[16]

$C_nH_{2n-78}$

$C_{57}H_{36}$

**1,2,3,4,5,6-Tri-[2′,1′-(4′-benzyl-acenaphtho)]-benzene**



M. P., °C
270[8]
267–270[7]

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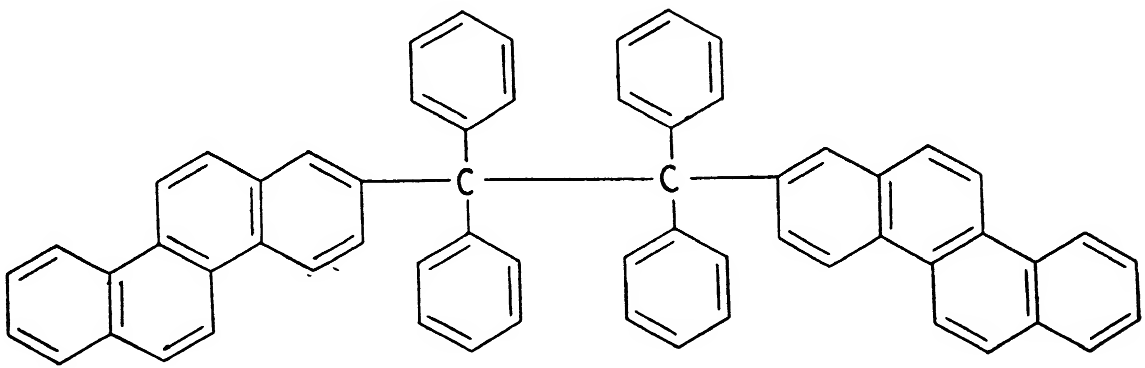
*This series continued on next page*

$C_nH_{2n-82}$

$C_{62}H_{42}$

**1,1,2,2-Tetraphenyl-1,2-di-(2′-chrysyl)-ethane**



M. P., °C

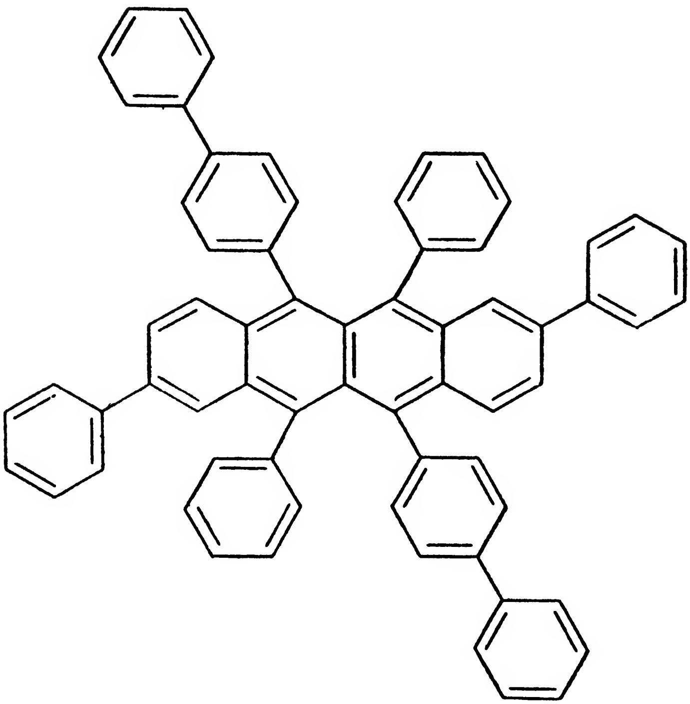
239[21]

*This series continued on next page*

## $C_nH_{2n-88}$

## $C_{66}H_{44}$

### 2,6,8,12-Tetraphenyl-5,11-di-*p*-biphenylylnaphthacene



M. P., °C
320 (a)[3]
(a) This compound remelts at 380.

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